STUDY ON HEALTH QUALITY OF JUTE SEEDS AND TRANSMISSION BEHAVIOR OF *Colletotrichum corchori* FROM SEED TO PLANT TO SEED

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CERTIFICATE

This is to certify that thesis entitled "**STUDY ON HEALTH QUALITY OF JUTE SEEDS AND TRANSMISSION BEHAVIOR OF *Colletotrichum corchori* FROM SEED TO PLANT TO SEED**" submitted to the faculty of agriculture, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **MASTER OF SCIENCE IN PLANT PATHOLOGY**, embodies the result of a piece of *bona fide* research work carried out by **Nazmul Hasan**, Registration No. 06-02102 under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

I further certify that such help or source of information, as has been availed of during the course of this investigation has duly been acknowledged.

Dated: 31/12/2013

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Dedicated To-

My Parents,
Who Laid the Foundation of My Success

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The Author

Study on health quality of jute seeds and transmission behavior of C*olletotrichum corchori* from seed to plant to seed

ABSTRACT

Altogether 600 seed samples of jute of CVL-1 of four seed tires namely breeder seed (15), foundation seed (5), certified seed (7) and farmers' seeds (573) were tested in the laboratory of the Department of Plant Pathology, BJRI during October, 2010 to April, 2012. Seed samples were categorized on the basis of presence of *Colletotrichum corchori* as 0%, 5%, 10%, 15%, 20% and 25%. Germination of the collected seed samples found to be varied significantly. The highest germination (96.00%) was recorded in breeder seeds and the lowest (67.33%) was in farmers' seeds. In seedling symptom test, the highest (96.00%) and the lowest germination (73.00%) were recorded in case of seeds having 0.00% and 25% initial seed borne infection of *C. corchori*, respectively. Incidence of anthracnose increased with the increase of time. Seeds having higher level of seed infection with pathogens caused higher reduction of seed germination. Lower germination was recorded at higher prevalence of initial seed borne infection by *C. corchori.* Negative co-relationships between initial seed borne infection of *C. corchori* and seed yield parameters of harvested seeds were observed. Relationships between % seed germination and % total presence of pathogens in the seed was negative. Germination of the harvested seeds lowered with the increase of initial seed borne infections of *C. corchori.* Seed borne infection by *C. corchori* in harvested seeds increased with the increase of initial seed borne infection of *C. corchori.* Seed yield decreased with the increase of initial seed borne infection of *C. corchori*. Positive co-relationship between initial seed borne infection by *C. corchori* and seed borne infection in harvested seeds both at greenhouse and under field conditions proof the transmission of *C. corchori* from seed to plant to seed as a seed borne pathogen.

LIST OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

CHAPTER 1

INTRODUCTION

1. INTRODUCTION

Jute (*Corchorus capsularis* L and *Corchorus olitorius* L) is one of the cash crops of Bangladesh. Jute is mostly grown in the Indo-Bangladesh region and in some countries of Southeast Asia. It has been reported that about 90% of world's jute is produced in Bangladesh and India (Atwal 1976). In respect of production, Bangladesh ranks first (15,23,320 tons annually) among the jute growing countries of the world (Wikipedia, 2011). The land and climatic conditions of Bangladesh are congenial for the production of high quality jute. In Bangladesh, about 7,08,723 hectares of land were under jute cultivation, where produced 15,23,320 tons at 2.15 tones/ha (FAO 2011).

Jute is a natural fibre belongs to Tiliaceae family and it has two species namely, *Corchorus olitarius* (Tossa Jute) and *Corchorus capsularis* (White Jute). The olitorius species is grown comparatively in high land and capsularis jute is grown in relatively in low land. Jute does not cause any health hazards and environment pollution. Traditionally jute has been used as a raw material for manufacturing yarns and twines, hessian, burlap and bulk packaging. Jute is also used in making different kind of artistic handicrafts which are also getting popularity day by day at home

and abroad. Jute has been closely attached with our cultures, society and economy in Bangladesh for centuries. A considerable amount of foreign currency is still earned by the country through exporting Jute and Jute goods.

According to Department of Agricultural Extension (DAE), during the year farmers cultivated jute in 8.33 lakh hectares of land in the year 2012 which was 4.8 lakh hectares in 2010 and the raw jute export of Bangladesh during 2011-2012 was 411 thousand tones that earned $198.5 million and the export volume of raw jute has increased by 8.17% compared to previous year 2010-11 whereas the export price gone down by 28.06%. In 2012, raw jute price moved radically in domestic market (Ferdous, 2013). Thus Bangladesh as a leader, in the market of jute in the world should pay proper attention to boost up the production of jute.

Jute suffers from 12 different diseases of which 10 are seed borne (Fakir, 2000). Among all the seed borne diseases except leaf mosaic are caused by fungi. The fungal pathogens *Macrophomina phaseolina*, *Botryodiplodia theobromae* and *Colletotrichum corchori*, respectively, causing stem rot, black band and anthracnose of jute are of major diseases that transmitted through seed (Fazli and Ahmed, 1960; Akanda and Fakir, 1985; Fakir and Islam, 1990). *Colletotrichum. corchori* is seed borne and

found only in *C. capsularis*. Other seed borne fungal pathogens of jute seeds are *Fusarium oxysporium, F. semitectum, Fusarium moniliforme, Curvularia lunata* and *Corynespora cassiicola*. These seed borne pathogens have been found to cause seed rot and infection to young seedlings. Besides, *Aspergillus, Penicillium* are frequently associated with stored jute seeds and responsible for reduction in germination. Quite often, the inocula of the seed borne pathogens from the infected seeds and seedlings are transmitted to the growing plants cause diseases in jute.

Macrophomina phaseolina, *Botryodiplodia theobromae* and *Colletotrichum corchori* are transmitted from seed to plant to seed (Fakir, *et al.* 1993). Study on transmission of seed borne infection of three major seed borne fungal pathogens- *M. phaseolina*, *B. theobromae* and *C. corchori* in jute revealed that higher seed borne infection resulted in higher disease development in the field. Transmission of *C. corchori* from infected seeds to the harvested seeds through the growing plants is a great threat for jute cultivation (Fakir, *et al.* 1993).

Few work regarding the seed health status of jute seeds of different tires and the transmission nature of *C. corchori* from seed to seedlings have been conducted by Fakir, *et al.* (1993) as Begum and Fakir (1991) in laboratory condition. But no detail study on the transmission rate of *C.*

corchori from seed to plant to seed has been conducted under field condition in the country. Keeping the view of the above facts and findings the present study was undertaken with the following objectives:

1. To test seed health quality of breeder seed, foundation seed, certified seed and farmers' seed.
2. To study the seedling symptom test for different level of initial seed borne infections of *C. corchori* under laboratory condition.
3. To determine the rate of transmission of *C. corchori* from seed to plant to seed under greenhouse and field condition.
4. To determine the incidence of anthracnose disease and its affect on seed yield parameter for different level of initial infection of *C. corchori*

CHAPTER 2

REVIEW OF LITERATURE

2. REVIEW OF LITERATURE

Considerable amount of research work has been conducted on jute seeds regarding seed borne pathogens and for controlling the various seed borne diseases in jute. But literature on the production of quality healthy jute seeds is rare in Bangladesh. Relevant literature available on fungal pathogens associated with jute seeds, seed treatments with chemicals, plants extracts/ botanicals and effect of sowing method on the production of quality healthy jute seeds and seed yield are reviewed and presented in this chapter.

2.1. Fungal pathogens associated with jute seeds

Shaw (1921) reported that black-band of jute caused by *Botryodiodiplodia theobromae* was seed borne. While working on the seed transmission of *Macrophomina phaseolina* in India, Rajan and Patel (1946) showed that pathogen was externally as well as internally seed borne in jute. Baxter (1960) reported that *M. phaseolina*, *Diplodia corchori* were the most predominant and important seed borne pathogens of jute.

It has been demonstrated in Jute Agriculture Research Institute, Calcutta, India that the seed borne *Colletotrichum corchorum* was responsible for the mortality of jute seedlings at high rate in the field (Anon. 1958).

Fazli and Ahmed (1960) in their study found that fungal organisms associated with jute seeds were responsible for affecting viability and causing infections to seedlings. Among these *Macrophomina phaseolina*, *Diplodia corchori* and *Colletotrichum corchori* are mainly seed borne pathogens. Besides these pathogenic organisms, there are many saprophytes associated with jute seeds, which deteriorates the quality of jute seeds during storage.

From India, Agarwal and Singh (1974) detected *Alternaria tenuis, Arthobotrytis* sp., *Cephalosporium* sp., *Curvularia lunata*, *Epicoccum* sp., *Fusarium moniliformae*, *Fusarium semitectum, Helminthosporium tetramera, Macrophomina phaseoli* , *Periconia* sp., *Trichothecium* sp., in seeds of four varieties of jute namely, JRC 212, JRC 321, JRO 632 and JRO 878.

While working on seed borne pathogens of jute at DGISP, Copenhagen, Miah (1974) found that in all the seed samples tested were heavily infected with different fungi. He detected forty four fungal organisms in

the jute seeds collected from Banglasesh. The most predominant fungi encountered were *Ascochyta corchoricola, Botryodiodiplodia theobromae, Cercospora corchori, Colletotrichum* spp., *Corynespora cassicola, Macrophomina phaseolina*, and *Rhizoctonia solani*, *Colletotrichum corchori* was not found in olitorius jute seeds. He also reported that seed borne fungal organisms affect the seed germination and seedling survival.

At Bangladesh Agricultural University (BAU), Fakir (1977) recorded the presence of *Corynespora cassiicola* in 28 jute seed samples collected from Mymensingh, Pabna and Tangail districts of Bangladesh and found that the fungus was associated with the ungerminated seeds and pathogenic to young seedlings. Michail *et al*. (1977) also detected *Rhizoctonia solani* as seed borne fungal organisms in jute.

Analyses of health status of farmers' jute seeds of Mymensingh district was cdonducted at BAU showed that rarely a seed was free from *Macrophomina phaseolina, Botryodiodiplodia theobromae*, *Colletotrichum corchori* and as high as 50.0 %, 75.0 % and 85.5% seed borne infection of *B. theobromae*, *C. corchori* and *M. phaseolina*, respectively, were observed in certain seed lots (Akanda , 1978).

Freire and Albuquerque (1978) reported that black spot caused by *Colletotrichum corchori* was a serious disease on jute in the Amazan region of Brazil. This pathogen was isolated from the depressed lesions found on the capsules. The pathogen was also detected in mycelial forms in the seeds.

Ahmed *et al*. (1980) tested 110 jute seed samples in the laboratory obtained from different stations of Bangladesh Jute Research Institute (BJRI) and reported that there were 20%, 37 % and 66% seed borne infections of *Macrophomina phaseolina*, *Botryodiplodia theobromae* and *Colletotrichum corchori* respectively in certain variety of jute at certain locality. Eight samples of D-154, 1 of CVE-3, 15 of CC –45, 10 of CVL-1 were not recommended for sowing as over 15% seeds were infected by these three major pathogens. Presence of *Phoma*, *Phomopsis*, *Corynespora*, *Cercospora*, *Myrothecium*, *Fusarium* and *Chaetomium* spp. were also detected.

Ahmed and Sultana (1982) tested the jute seed health of a total number of 56 samples in the laboratory by PDA and Blotter method. The highest seed borne infection of *Botryodiplodia theobromae*, *Macrophomina phaseolina* and *Colletotrichum corchori* were found to be 7%, 7%, and

5% in samples of D-154 from Faridpur, CC-45 and CVL-1 from Chitla, respectively.

Ahmed and Sultana (1983) carried out a routine seed health test at BJRI to determine the percentage of infected seeds and to make recommendation for sowing. A total of 78 jute seed samples received from Tarabo, JAES, Monirampur, Faridpur, Chandina, Central station, Kishoregonj and from India were tested. Maximum infection of *Macrophomina phaseolina* (20%) was recorded in CVE-3 from Chandina. JRC- 4 from India yielded 19% of *Botryodiplodia theobromae*. There was 12 % infection of *Colletotrichum corchori* recorded in CC –45 from Kishoregonj.

Rangaswami (1984) described the fungus *Macrophomina phaseolina*, the causal organism of stem rot of jute. Under favorable condition, disease spreads and kills the seedlings. Often the diseases spread rapidly and cause damping-off of seedlings. Infection often spread from the basal stem to roots killing the plant. Pycnidia are formed on the infected roots and stem and in other rotting tissues. When infect the inflorescence, the capsules are discoulored to black and infected seeds become discoloured and small.

Akanda and Fakir (1985a) worked with 43 seed samples of *Corchorus capsularis* collected from various locations in Mymensingh district and found that three had pure infection of *Macrophomina phaseolin*, 12 had mixed infection of *Botryodiplodia. theobromae* and *M. phaseolina* and 10 had mixed infection of *Colletotrichum. corchori* and *M. phaseolina. M. phaseolina* was predominant species (39.6%) followed by *B. theobromae* (11.1%) and *C. corchori* (7.8%). Germination of seed samples varied from 20-68 %. Low germination percentage was recorded due to high prevalence of pathogens.

Fakir *et al.* (1988) recorded *Curvularia lunata* and *Fusarium* spp. (*F. oxysporum, F. semitectum*) in jute seeds during routine seed health analysis in Seed Pathology Laboratory, BAU, Mymensingh. The two pathogens *C. lunata* and *Fusarium* spp. were encountered in 66.3 % and 95.5% seed samples, respectively collected from 80 selected farmers representing 10 villages under 5 union of Sader Upazila, Mymensingh. The highest seed borne infection of *C. lunata* and *Fusarium* spp. was found to affect the health of jute seeds and the two fungi were associated with 60.0% and 75.0% ungerminated and rotted seeds, respectively. According to them, 10-15 % emerging radicals got infection by the three fungal pathogens.

Ahmed and Sultana (1985) analysed 379 seed samples of jute collected from farmers' and markets of Sonargaon, Nabinagar and Jamalpur. Three important fungal pathogens namely, *Botryodiodiplodia theobromae*, *Colletotrichum corchori* and *Macrophomina phaseolina* which were commonly found in the collected seed samples. Of these three pathogens, highest percentage of seed borne infection was recorded in case of *C. corchori* (42%). As high as 35.0% seed borne infection of *M. phaseolina* was detected in seed sample obtained from Jamalpur market in 1984.

Sultana and Ahmed (1985) at BJRI examined the health status of 82 jute seed samples collected from different experimental stations and recorded maximum infection of *Macrophomina phaseolina* (22%) in the sample CVE-3 collected from JAES. They also recorded the highest infection of *Botryodiplodia theobromae* in Dhabdhabey and *Colletotrichum corchori* (80%) in CVL-1 collected from Kishoregonj station.

Sultana and Ahmed (1986) tested 1137 seed samples obtained from different regional stations of BJRI for detection of seed borne pathogens under the projects "Survey on Jute Seed Quality". Maximum seed borne infection of *Macrophomina phaseolina* (20%), *Colletotrichum corchori* (20%) and *Botryodiplodia theobromae* (30%) were recorded in Dhabdhadey (central station) and D-154 (Nashipur and Chandina).

Out of 77 seed samples of jute collected from five districts viz. Dhaka, Manikgonj, Comilla, Chittagong and Jamalpur during 1985-86 and 1986-87, altogether 12 different fungi were detected in jute seeds. The most predominant fungi encountered were *Colletotrichum. corchori* (31.11%), *Sclerotium rolfsii* (23.93%) , *Chaetomium* (10.04%), *Curvularia* (5.2%), *Trichoderma* sp. (3.7%) and *Macrophomina phaseolina* (3.22%). Most of the fungi were found to affect the rate of germination (Anon. 1987).

Halder and Anwar (1988) isolated altogether 12 different genera of fungi from jute seeds collected from five south-eastern districts of Bangladesh. Of all the fungi encountered, *Colletotrichum corchori* and *Sclerotium rolfsii* causal organisms of anthracnose and foot rot, respectively appeared to be the most predominant.

At BJRI, Sultana *et al.* (1988) tested 487 jute seed samples for health status, which included 159 breeder seed samples, 277 samples from IJO and 51 from Gene Bank accessions. They obtained maximum number of infection (30% each) with *Macrophomina phaseolina* and *Colletotrichum corchori* in local capsularis variety from Gene Bank. CVL-1 from JAES had 22 % infected seeds followed by 21% in *C. corchori* from Kishoregonj . Fourteen samples including CVL-1 from JAES, D-154 and

Dhabdhabey from Kishoregonj were not recommended for sowing as they had higher percentage of infected seeds.

While conducting the Growing-on test for determination of seed borne fungal pathogens in jute, Begum (1989) found that *Colletotrichum corchori*, *Botryodiplodia theobromae* and *Macrophomina phaseolina* caused germination failure, seed rot and produced disease symptoms on growing seedlings. According to her, most seed rots were caused by each of the three pathogens. Among the three pathogens, *C. corchori* caused maximum seed rot and minimum seedling infections in sand culture.

Plant Pathology Division of BJRI, Dhaka made a routine health test of jute seeds of two cultivated species (*Corchorus capsularis* and *Corchorus olitorius*) obtained from different research stations as well as from the contact growers and observed that the three major fungal pathogens – *Botryodiplodia. theobromae*, *Colletotrichum corchori* and *Macrophomina phaseolina* causing black band, anthracnose and stem rot diseases, respectively were frequently seed transmitted. During the survey, the highest seed borne infection by *B. theobromae, C. corchori* and *M. phaseolina* were recorded as 30%, 37% and 51%, respectively (Anon. 1990).

Health analysis of traditional varieties of jute (*Corchorus capsularis*) seeds collected from 200 farmers of Mymensingh sadar thana revealed that all the seed samples were infected by one or more fungal pathogens. The pathogens encountered in jute seeds were *Botryodiplodia theobromae*, *Colletotrichum corchori* , *Curvularia lunata* , *Fusarium* spp. and *Macrophomina phaseolina*. Of these, *C. corchori* appeared to be the most predominant one occurring in 65 seed samples out of 80 and as high as 87% seed borne infection of the pathogen was recorded (Fakir, *et al.* 1990)

Fakir, *et al*. (1991) reported that there were six different seed borne diseases of jute caused by 10 different fungal organisms in Bangladesh. Of all these pathogens, *Botryodiplodia theobromae*, *Colletotrichum corchori* and *Macrophomina phaseolina* were responsible for causing black band, anthracnose and stem rot, respectively and most widely distributed in the country. Each of these three diseases had major effects on seed production.

Seed samples of jute collected from 5 districts of Bangladesh were detected during 1985 and 1986 for the association of fungal pathogens by standard blotter and agar plate methods. Altogether, 12 genera were detected of which *Colletotrichum corchori* Ikata and Yoshida, *Sclerotium*

rolfsii Sacc. were found to be predominant. The percentage of occurrence of fungi varied markedly with respect to collection as well as with methods of detection (Haider *et al.* 1992).

Khan (1992) studied on the occurrence of seed borne fungal pathogens in jute at different stages of seed development and maturation using the cultivar "Deshi Pat" (*Corchorus capsularis* L.). Altogether, 9 different fungi viz. *Botryodiplodia theobromae, Cercospora corchori, Colletotrichum corchori, Curvularia lunata, Fusarium oxysporum, F. semitectum, F.* spp. and *Macrophomina phaseolina* were found to be associated with 1-3 weeks old growing pods. Of these, five fungi namely- *C. lunata, F. semitectum, F, oxysporum F.* spp. and *M. phaseolina* were found to infect the developing seeds in the three weeks old growing pods. Eight fungi were recorded during 3-10 weeks period of seed development and maturation.

Fakir, *et al.* (1993) reported that transmission of the major seed borne diseases including stem rot caused by *Macrophomina phaseolina,* black band caused by *Botryodiplodia. threobromae* and anthracnose caused by *Colletotrichum corchori,* from seed to plant to seed revealed that germination of the seeds was found to decrease with the increase of the seed borne infection and resulted significantly higher amount of disease

development in the field. However, the rate of transmission of the three test pathogens from infected seeds to the growing plants and finally to the harvested seeds was relatively low

Khan and Fakir (1993) reported that nine different pathogenic fungi namely *Botryodiplodia theobromae*, *Cercospora corchori*, *Colletotrichum corchori*, *Corynespora cassiicola*, *Curvularia lunata*, *F.* oxysporum, *F. semitectum*, *F.* spp. and *Macrophomina phaseolina* were detected in one week old growing jute capsules. *Cercospora corchori* was the most predominant (36.4%) fungus followed by *C. lunata* (29.4%). Only *C. lunata*, *F. oxysporum*, *F. semitectum*, *Fusarium*. sp. and *M. phaseolina* were found to infect the developing seeds of three weeks old capsules. Of these, *Fusarium* spp. (2.8%) were more frequently detected in developing seeds followed by *M. phaseolina* (1.8%).

Sahu and Behera (1996) studied the surface and sub-surface fungal flora of jute (*Corchorus capsularis* and *C. olitorius*). Of the seed coat fungi, *Aspergillus* was the dominant species followed by *Penicillium*. The recorded endophytes were *M. phaseolina*, *F. oxysporum* , *F. semitectum* and *S. rolfsii* (*Corticium rolfsii*)

Fakir (1998) studied on the health status of jute (*Corchorus capsularis* var. local Deshipat) seeds collected from 80 farmers representing 10 villages under 5 union of Mymensingh sadar district. He observed that no seed sample was completely free from pathogens. The pathogens encountered were *Botryodiplodia theobromae*, *Colletotrichum corchori*, *Curvularia lunata*, *Fusarium* spp. and *Macrophomina phaseolina*. Each of all the tested seed samples was infected by at least three fungal pathogens. Among these, *C. corchori* appeared to be the most prominent occurring in 65 seed samples out of 80 tested and as high as 87.0% seed borne infection of the pathogens was recorded. The pathogens associated with the seeds were found to cause seed rot/germination failure and seedling infection. Average germination of most of the seed samples was below 80 %, lower than the national germination standard. In general, low germination was related to high prevalence of seed borne infection of the pathogens. Seed borne infection of the three most destructive pathogens – *B. theobromae*, *C. corchori* and *M. phaseolina*, respectively responsible for causing black band , anthracnose, and stem rot of jute , were always much higher than the recommended national seed health standard fixed for these pathogens .

Fakir (2001) reported that jute suffered from 12 different diseases. Of all these diseases, 10 were known to be seed borne. Among the seed borne diseases, except leaf mosaic (caused by virus), all other diseases were caused by fungal pathogens.

Islam *et al*. (2003) reported that as the initial seed borne infections increases, disease development in the field also increases. Fibre yield contributing characters, (plant height and base diameter) and fibre weight decreases with the increase of initial seed borne infections.

Islam *et al.* (2003) reported that inoculation with the pathogens was conducted on 45, 55, 65 days age of the jute plants. Variety BJC-7370 and CVL-1 of jute had reaction with strains MS-6, MS-9, and CS-1 at every inoculation times. The gradual increase of inoculation affected the plants. As the time of inoculation increases the lesion size on stem decreases, the number of pods plant-1, seeds plant-1 and Seed germinations (%) increases and at the same time seed infections (%) decreases. MS-6 strain was found more virulent than MS-9 and CS-1 regarding pods plant-1 and seeds plant-1 production, as well as seed germinations and infections (%).

Islam *et al.* (2003) reported that total seed borne infections were minimum in breeder seeds and that of maximum in farmers' seeds. Negative relationship between % germination and % total fungal pathogens were observed. Regression coefficient (β) were -0.95, -0.85, -0.78 and -0.82 in CVL-1, CVE-3, O-9897 and O-4, respectively which indicates for every 1% increase of seed borne infection there were corresponding decrease of 0.95, 0.85, 0.78 and 0.82%

Islam and Fakir (2007) reported that the poorest performance was observed in farmers' seeds. Seven different pathogenic fungi – *Botryodiplodia theobromae, Colletotrichum corchori, Corynespora cassicola, Carvularia lunata, Fusatium moniliforme,F. semitectum* and *Macrophomina phasiolina* were detected in seeds of all seed classes. All seed quality parameters were comparatively better in breeder seeds than foundation seeds. As certified seeds had better performance than farmers' seeds, so certified seeds should be used for fibre production at farm level and therefore, proper care should be taken in the production and storage of certified seeds.

Sultana *et al.* (2007) reported that the germination percentage was more in laboratory conditions than that of field conditions. Seeds having higher

seed borne infections caused significantly higher amount of diseases development in the field.

Pervin *et al.* (2012) reported that Breeder seeds had the best performance in all the seed quality attributes as compared to foundation, certified and farmers' seeds. The lowest performance was observed in farmers' seeds. Seven different causal organisms of fungal disease *Botryodiplodia theobromae, Colletotrichum corchori, Corynespora cassicola, Curvularia lunata, Fusarium moniliforme, F. semitectum and Macrophomina phaseolina* were detected in seeds of all seed classes. All seed quality parameters were comparatively better in breeder seeds than foundation seeds. Certified seeds had better performance than farmers' seeds. So, certified seeds should be used for fibre production at farm level. Therefore, proper care should be taken in the production and storage of certified seeds.

CHAPTER 3

MATERIALS AND METHODS

3. MATERIALS AND METHODS

3.1. Experimental Site

The experiments were conducted both in Seed Pathology Laboratory and Green House, Plant Pathology Department, Pest Management Division, Bangladesh Jute Research Institute and in the fields of Jute Agriculture Experiment Station, Manikgonj and in the field of Regional station of Bangladesh Jute Research Institute, Chandina.

3.2. Experimental Period

The experiments were conducted during the period from June, 2011 to December 2012

3.3. Jute variety

The variety CVL-1 belonging to deshi pat (*Corchorus capsularis*) of different seed tires was used for conducting the experiments.

3.4. Collection of seed sample from different sources

Altogether 600 seed samples were collected from different locations of Bangladesh of which there were 15 breeders, 5 foundation seeds, 7 certified seeds and 573 farmeres' seeds. Breeder seeds were collected from 6 locations such as Faridpur, Kishorgonj, Manikgonj, Monirmpur,

Patukhali and Rangpur. Foundation seeds were collected from 2 locations such as Nashipur seed production centre and Chitla seed production centre of BADC. There were 7 certified seeds which were collected from 6 regions such as Bogra, Dhaka, Jessore, Kushtia, Rajshahi, Tangail. There were all together 573 farmer's seed which were collected from 24 regions in Bangladesh such as Chandina, Dhaka, Dinajpur, Gazipur, Jessore, Karimgonj, Karimpur, Kishorgonj, Kushtia, Kurigram, Manikgonj, Meherpur, Monirampur, Nasipur, Pakhimara, Poba, Patuakhali, Rangpur, Saturia, Tangail, Tarabo and some seed companies. (Table.1)

Table.1. Sources of collected seed samples

Collection of Breeder Seed			
Seed Tire	Location	No. of Seed Samples	Total no. of Seed Samples
Breeder Seed	Faridpur	3	15
	Kishorgonj	2	
	Manikgonj	1	
	Monirampur	4	
	Patuakhali	1	
	Rangpur	4	
Total no. of location = 6			
Collection of Foundation Seed			
Seed Tire	Location	No. of Seed Samples	Total no. of Seed Samples
Foundation Seed	Chitla	1	5
	Nasipur	4	
Total no. of location = 2			
Collection of Certified Seed			
Seed Tire	Location	No. of Seed Samples	Total no. of Seed Samples
Certified Seed	Bogra	1	7
	Dhaka	1	
	Jessore	1	
	Kushtia	1	
	Rajshahi	1	
	Tangail	2	
Total no. of location = 6			

Table continued

Collection of Farmers' Seed			
Seed Tire	Location	No. of Seed Samples	Total no. of Seed Samples
Farmers' Seed	Chandina	162	573
	Dhaka	13	
	Dinajpur	30	
	Gazipur	15	
	Jessore	10	
	Karimgonj	9	
	Karimpur	7	
	Kishorgonj	12	
	Kushtia	15	
	Kurigram	56	
	Manikgonj	50	
	Meherpur	16	
	Monirampur	11	
	Nasipur	4	
	Pakhimara	10	
	Poba	38	
	Patuakhali	4	
	Rangpur	15	
	Saturia	38	
	Tangail	44	
	Tarabo	11	
	Seed company	3	
No. of location = 24			

3.5. Seed collection procedure

Seed samples were obtained from the seed lots of each tier. Primary seed sample of 50g were randomly taken from 10 different positions of the seed lot. All the primary seed samples were mixed thoroughly to make a composite sample. Thus each composite sample was 500 g of seeds. As the size of each composite sample was 500 g, so it was regarded as submitted sample. The submitted seed samples were kept in plastic container. All the seed samples were labeled properly and preserved in Gene Bank of BJRI at 5^0 C till the samples were used for conducting respective research. Working seed samples were taken from the preserved seed samples as per requirement. Total procedure was maintained following the Rules of ISTA (ISTA, 1999).

3.6. Laboratory Experiments

3.6.1. Determination of germination

Following the rules of ISTA (1999), four hundred seeds were taken randomly from the well-mixed seed sample (ISTA, 1999). The working samples were divided into four replications and thus one replication contained 100 seeds. To ensure adequate spacing, 100 seeds were divided into four sub replications and each sub replication contained 25 seeds. The seeds were germinated on top of three layers of Whatman no.1 filter paper. The filter papers were soaked in water and placed at the bottom of

9-cm diameter plastic petri dish and thereafter 25 seeds were placed on the top of filter paper. Thus 400 seeds were placed in 16 replicate petri dishes. Evaporation of water was minimized by tightly fitting the lids of the petri dishes. The petri dishes were placed inside the incubator maintaining the temperature at 30^0C for five days. Seeds producing both plumule and radical after incubation were counted as germinating seeds. The result was expressed as percentage.

3.6.2. Seed health analysis for detection of *C. corchori* in jute seeds

Seed health analysis of 600 seed samples of variety CVL-1 was conducted by blotter method following the International Rules for Seed Health Testing (ISTA, 1999). In this method 9 cm diameter plastic petridish and locally packed Whatman no. 1 filter paper were used. Two hundred seeds were taken randomly and placed on the moist filter paper in eight replicate petridished. The petridishes with seeds were then incubated at 22 ± 2^0C for seven days in the laboratory. After incubation, seeds were examined under stereomicroscope and the pathogen, *C. corchori* were identified by following the key of Sutton (1980). Collected seed samples from all seed tires were categorized on the basis of presence of *Colletotrichum corchori* as 0%, 5%, 10%, 15%, 20% and 25% infection with *C. corchori* for conducting further experiment. (Table. 2)

Table 2: Selected seed samples associated with *Colletotrichum corchori* and other seed borne pathogens.

Sample No.	% g*	% Pathogens							
		Colletotrichum corchori	*Macrophomina phaseolina*	*Botryodiplodia theobromae*	*Fusarium* spp	*Aspergillus* spp	*Penicilium* spp	Other	Total
1/A	98	3	0	0	0	0	3	0	6
12/A	85	10	0	0	4	0	0	0	14
157/A	80	12	0	0	26	1	0	0	39
167/A	54	25	0	0	8	3	0	0	22
173/A	71	21	1	0	15	1	0	2	30
192/A	64	20	0	0	21	0	0	0	41
193/A	64	20	0	0	13	0	0	0	33
198/A	75	15	0	0	10	0	0	0	25
481/A	95	0	0	0	9	0	3	2	14
511/A	96	0	0	0	0	3	0	0	3
561/A	90	5	0	0	11	5	1	0	22
591/A	93	0	0	0	6	7	3	0	16

*germination

3.6.3. Study on the nature and rate of transmission of *C. corchori* from seed to seedling

Nature and rate of transmission of *C. corchori* were determined by water agar test tube seedling symptom test (Khare *et al.* 1976). In this technique 6 ml 1% water agar were used in each glass test tube (2.0 cm diameter X 15 cm in length) and sterilized in autoclave. Highest percentage (25%) of pure infection was used for the study. Two hundred seeds @ one seed per test tube were placed for each sample and incubated in an air cooled room at 18 ± 3^0 C under fluorescent tube light. Disease symptoms of the pathogens developed on the germinating seeds and emerged seedlings in the test tube were recorded after 14 days of incubation.

3.7. Green house experiments

Experiments were set in the green house at the Central Research Station of BJRI using the jute variety CVL-1 with selected levels of seed borne infections of *C. corchori*. Sixteen inch earthen pots were used for the experiments. Soils collected from the jute fields were sterilized with 4% Formaldehyde solution. After sterilization, the soils were covered with a polythene sheet for 48 hours. Then the soils were uncovered and kept for 14 days on the sterilized floor of the green house with periodic stirring so that the toxic formalin vapor gets evaporated. Soil, thus sterilized was used for the pot experiments.

Different levels of seed borne infections of *C. corchori* viz. 0.0%, 5.0%, 10.0%, 15.0%, 20.0%, and 25.0% with *C. corchori* were used for conducting the experiments. Twenty five seeds were sown in each pot. Thus, altogether 200 seeds were sown in eight replicated pots for each treatment. Two chambers of the green house were used for the experiments. The experiments were conducted using Completely Randomized Design (CRD) in the green house at BJRI.

After sowing each seed were marked with a stick in order to ascertain that how many seeds failed to germinate due to *C. corchori.* Necessary

precautions were taken to maintain the sterile condition inside the green house. Temperature of the green house was adjusted to 28 ± 2^0 C.

Germination, emergence of normal seedlings and diseased/infected seedlings were recorded after two weeks of sowing. Un-germinated seeds were dug out and plated on wet blotter in the laboratory for isolation of *C. corchori*. Incidence of anthracnose on growing and maturing plants at the age of 4 weeks, 8 weeks and before harvest of the seed crop was recorded. Data on disease incidence recorded at before harvest of the crop were considered as final for interpretation of results. The disease incidence was expressed in percentage.

3.8. Field experiments

Experiments were conducted with jute variety CVL-1 at Jute Agricultural Experimental Station (JAES), Manikganj and Chandina Regional Station of BJRI. Different levels of seed borne infections *C. corchori* viz. 0.0%, 5.0%, 10.0%, 15.0%, 20.0% and 25.0% were used for conducting the experiments. The experiments were conducted following Randomized Complete Block Design (RCBD) with three replications. The size of the unit plot was 4m X 3m and the distance between plots and replications both were kept 1 m. Dhaincha was grown between the plots as barrier crop. Germination, emergence of normal seedlings and incidence of

anthracnose were recorded as done in the greenhouse. Incidences of other diseases were also recorded along with Anthracnose. Seed yield was recorded in kg/ha. Quality of the harvested seeds from each plot was judged by the two parameters viz. germination and health as done in case of green house experiments.

3.9. Statistical analysis

Laboratory experiment and greenhouse data were analysed following Completely Randomized Design (CRD), while the field experimental data were analysed by using Randomized Completely Block Design (RCBD). Mean comparisons among the treatments were compared by Duncan's Multiple Range Test (DMRT).

CHAPTER 4

RESULTS

4. RESULTS

4.1. Study on the status of germination and health of jute seeds collected from different sources of Bangladesh

4.1.1. Laboratory Experiments

4.1.1.1. Mean Percent germination and pathogens found in different seed samples collected from different locations of Bangladesh

Germination of seeds varied from 67.33% to 96.00% depending on the seed tiers and sources of collection (Table 3). Germination of seeds varied significantly while the lowest (67.33%) in farmers' seeds and the highest (96.00%) was in breeder seeds.

Seed borne fungal infections detected in breeder, foundation, certified and farmers' seeds collected from different locations are presented in Table 2. Findings revealed that breeder seeds always had healthiest quality followed by foundation seeds and the lowest health quality was noted in farmers' seed quality. The total mean seed borne fungal infections recorded in the survey study varied from 3.55 - 37.99% in different seed tiers and seed sources. The highest total percent mean seed borne fungal infections was recorded in CVL-1 under farmers' seed tire (37.99%) preceded by 24.00% under Certified seed tier and the lowest percent mean seed borne infection (3.55%) was recorded in breeder seed tier. The highest percent seed borne infection of *C. Corchori* (7.33 %)

recorded in farmers' seed and the lowest (1.00%) recorded in breeder seed.

Table 3: Mean Percent germination and pathogens found in different seed samples collected from different locations of Bangladesh

Seed Tire	Mean % g*	Mean % Pathogen							
		Colletotrichum corchori	*Macrophomina phaseolina*	*Botryodiplodia theobromae*	*Fusarium* spp	*Aspergillus* spp	*Penicilium* spp	Other	Total
Breeder	96.00 a	1.00 c	0.0 d	0.0 c	1.55 d	1.00 d	0.00	0 b	3.55
Foundation	92.00 ab	1.55bc	1.33 c	0 .0c	3.33 c	2.33 c	0.00	0 b	8.54
Certified	81.33 bc	3.33 b	3.67 b	2 b	5.67 b	4.33 b	3.00 a	2 a	24.00
Farmers'	67.33 c	**7.33 a**	**6.67 a**	**4.33 a**	**8.00 a**	**6.33 a**	**3.33 a**	**2 a**	**37.99**
Level of significance	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05

*germination

Data in column having common letter(s) do not differ significantly.

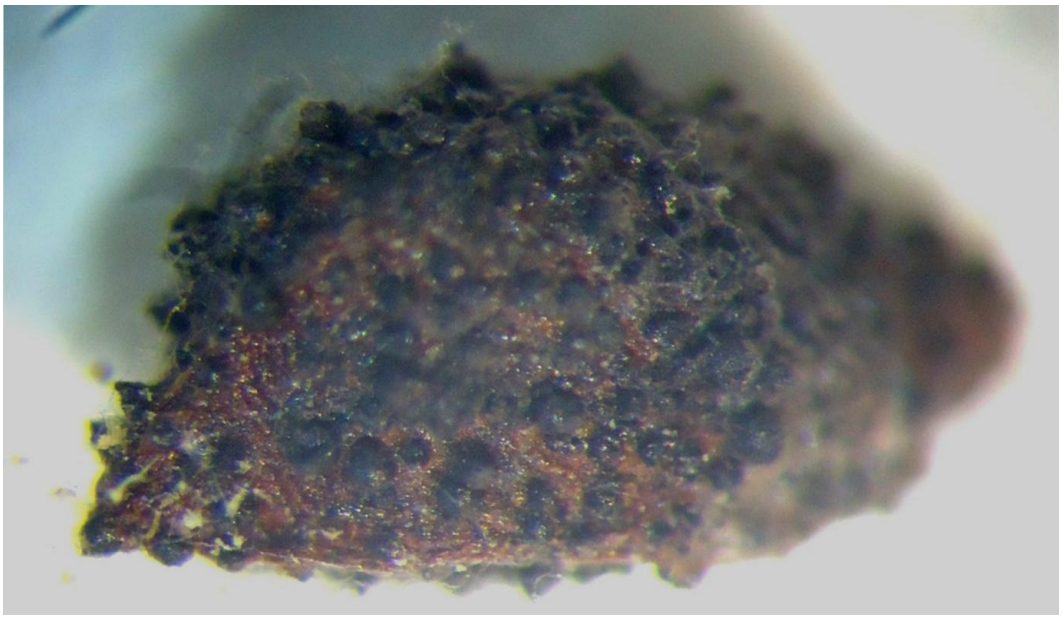

Plate.1. Seed infected with *Macrophomina phaseolina* observed under simple microscope

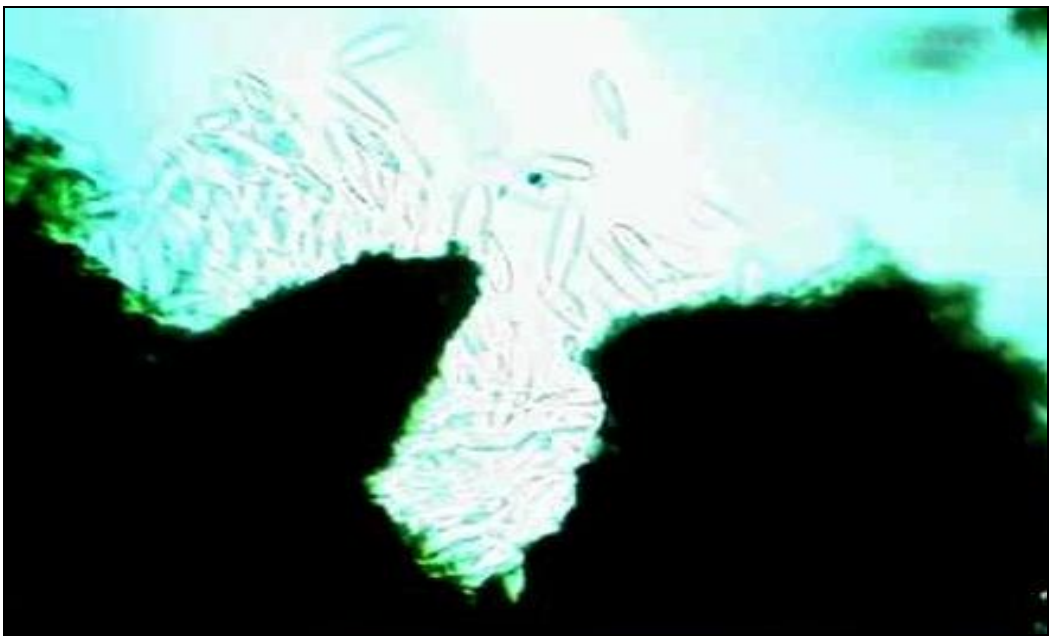

Plate. 2. Pycnidium and pycnidiospores of *Macrophomina phaseolina* observed under compound microscope

Plate.3. Jute seeds infected with *Botryodiplodia theobromae* observed under simple microscope

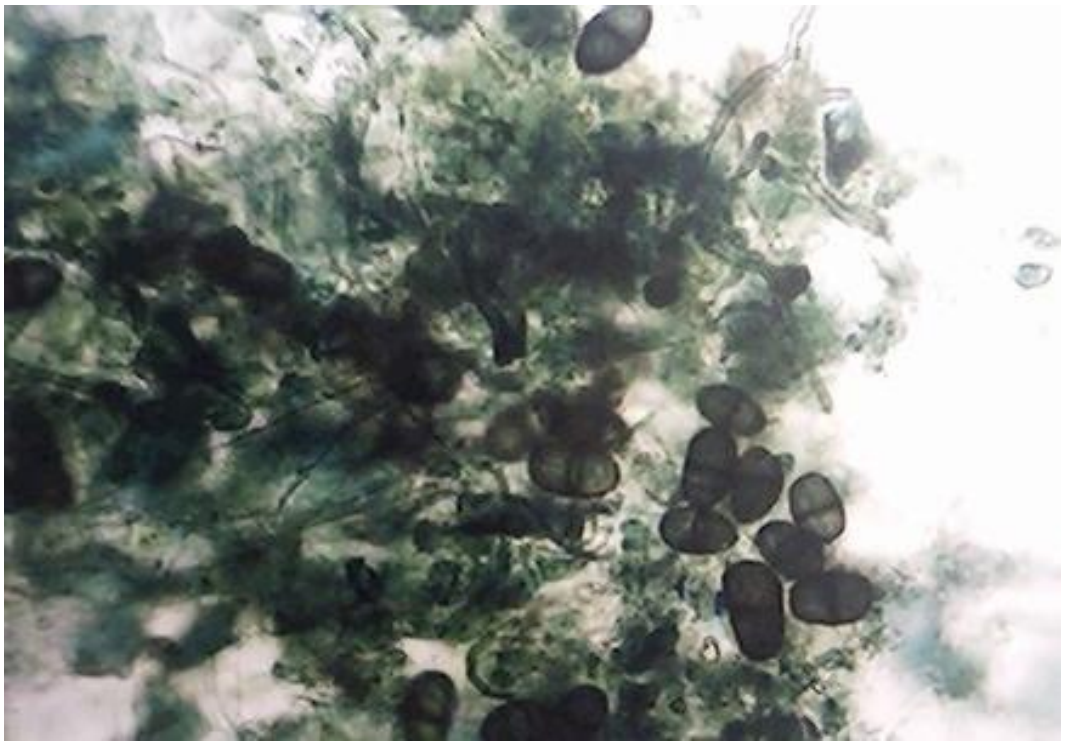

Plate. 4. Pycnidia and picnidiospores of *Botryodiplodia theobromae* observed under compound microscope

Plate. 5. Typical symptom of anthracnose on jute

Plate. 6. Jute seed infected with *Colletotrichum corchori* observed under simple microscope

Plate. 7. Jute seed infected with *Colletotrichum corchori* observed under simple microscope

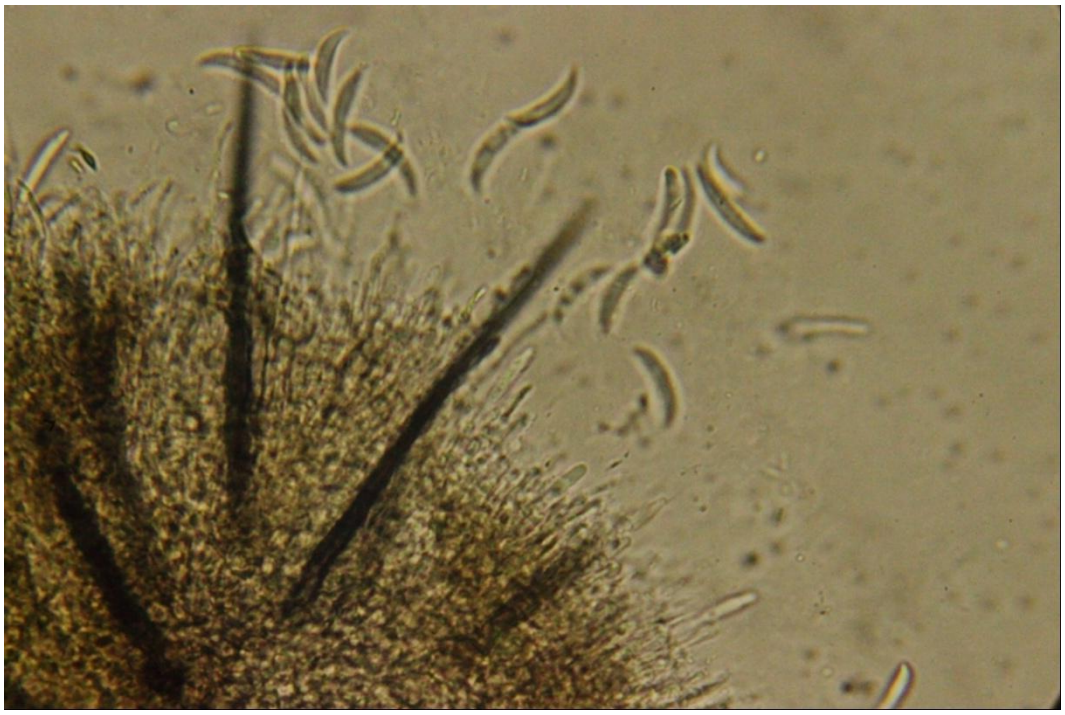

Plate. 8. Acervulas with conodiophores, conidia and black setae of *Colletotrichum corchori* observed under Compound Microscope

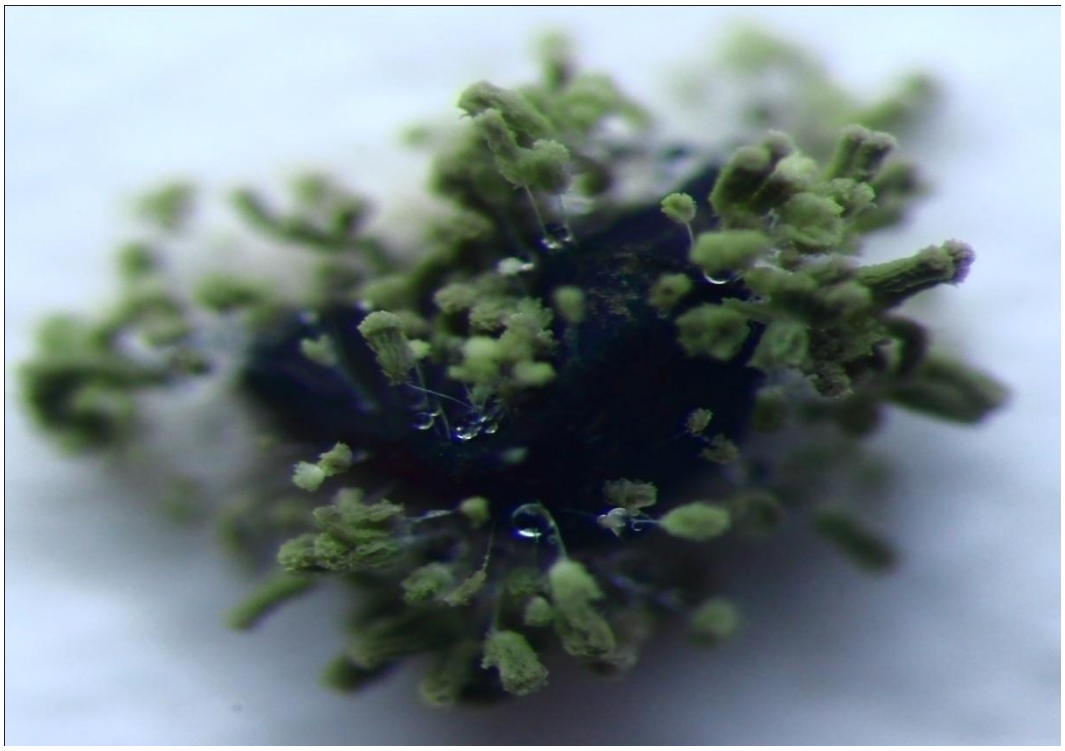

Plate. 9. Jute seed infected with *Aspergillus flavus* on Whatman filter paper observed under Simple Microscope

Plate. 10. Fruiting structure of *Aspergillus flavus* observed under compound microscope

Plate.11. Jute seed infected with *Aspergillus niger* on filter paper observed under simple microscope

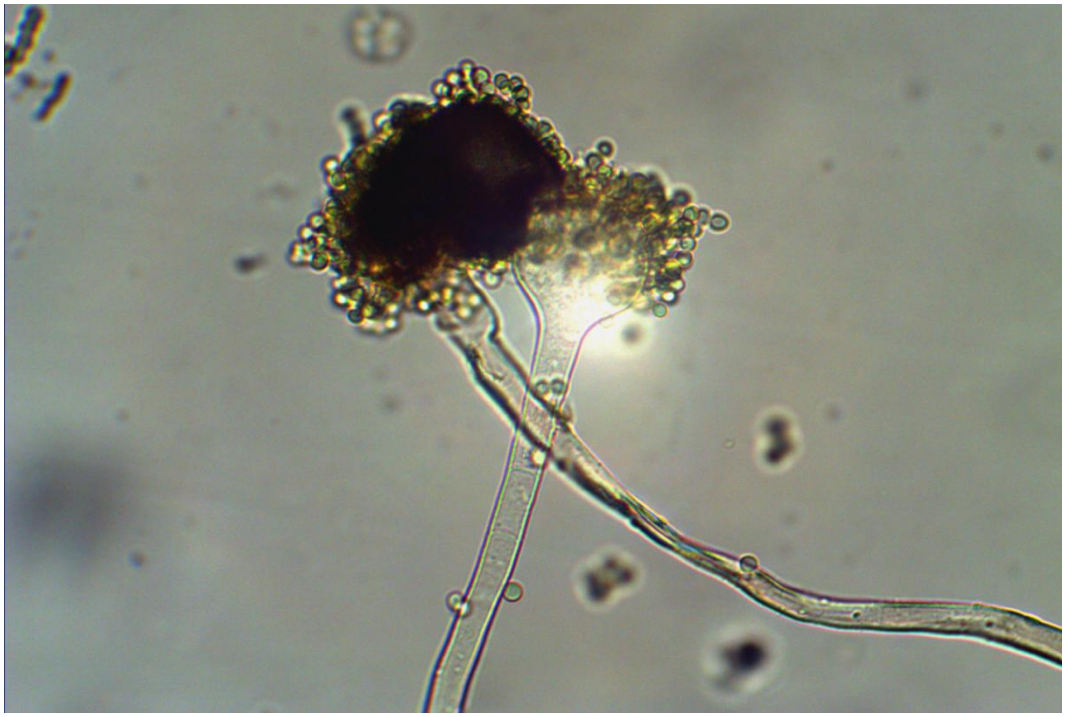

Plate. 12. Fruiting structure of *Aspergillus niger* observed under compound microscope

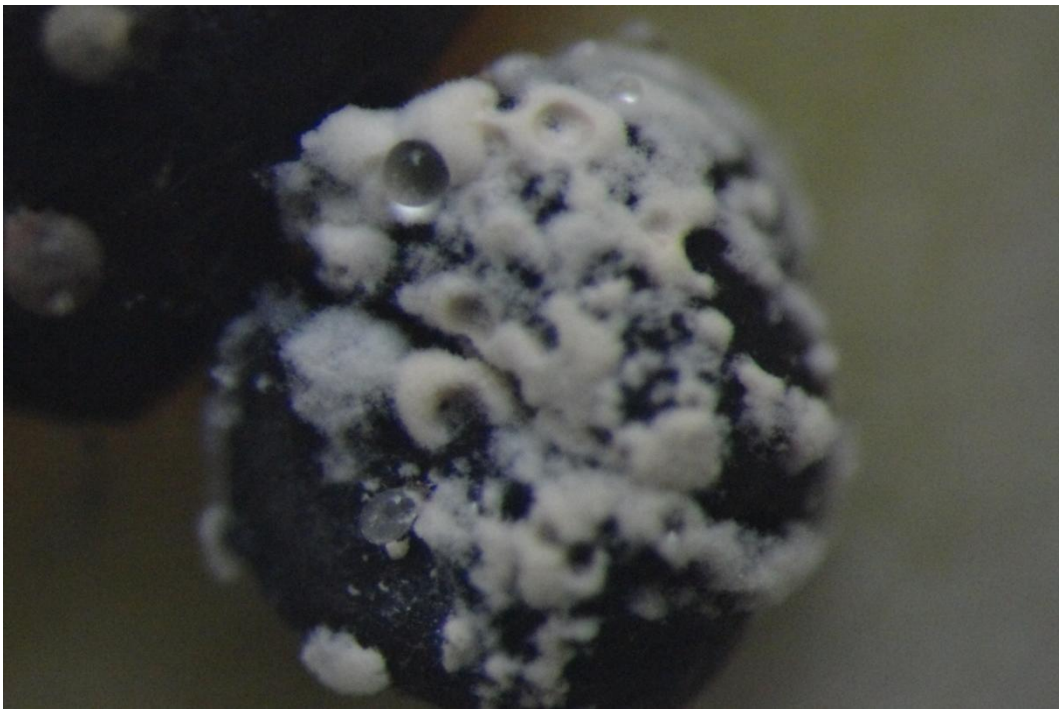

Plate. 13. Seed infected with *Fusarium* spp. observed under simple microscope

Plate. 14. Conidia of *Fusarium* spp. observed under compound microscope

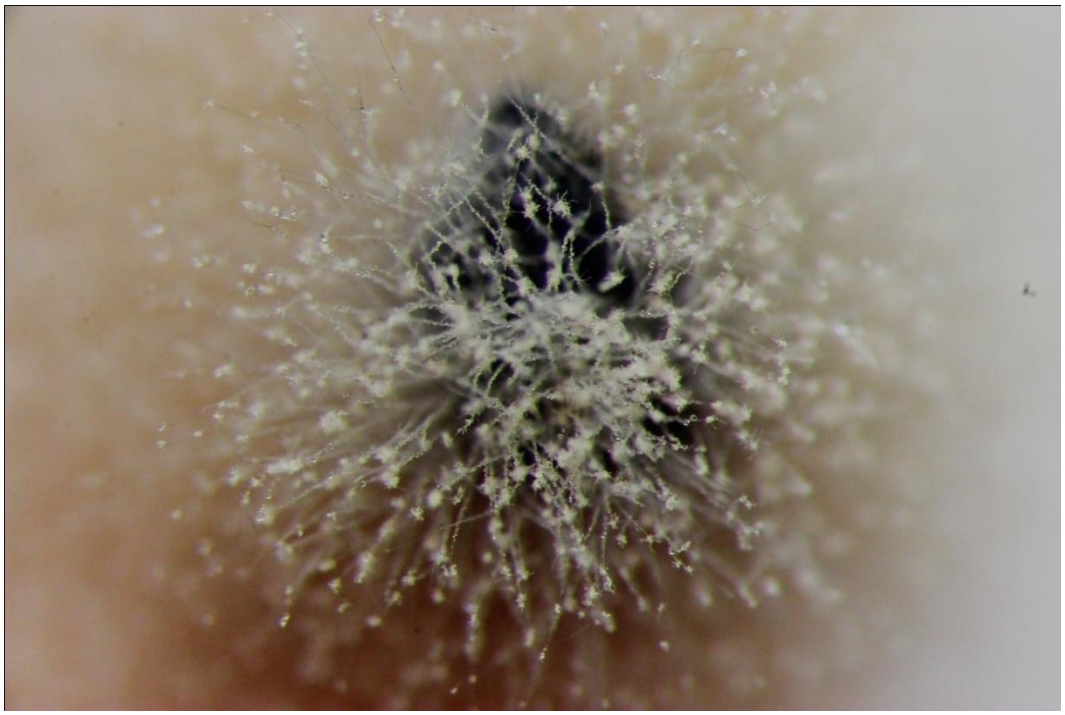

Plate.15. Seed infected with *Fusarium* spp. observed under simple microscope

Plate.16. Seed infected with *Fusarium* spp. observed under simple microscope

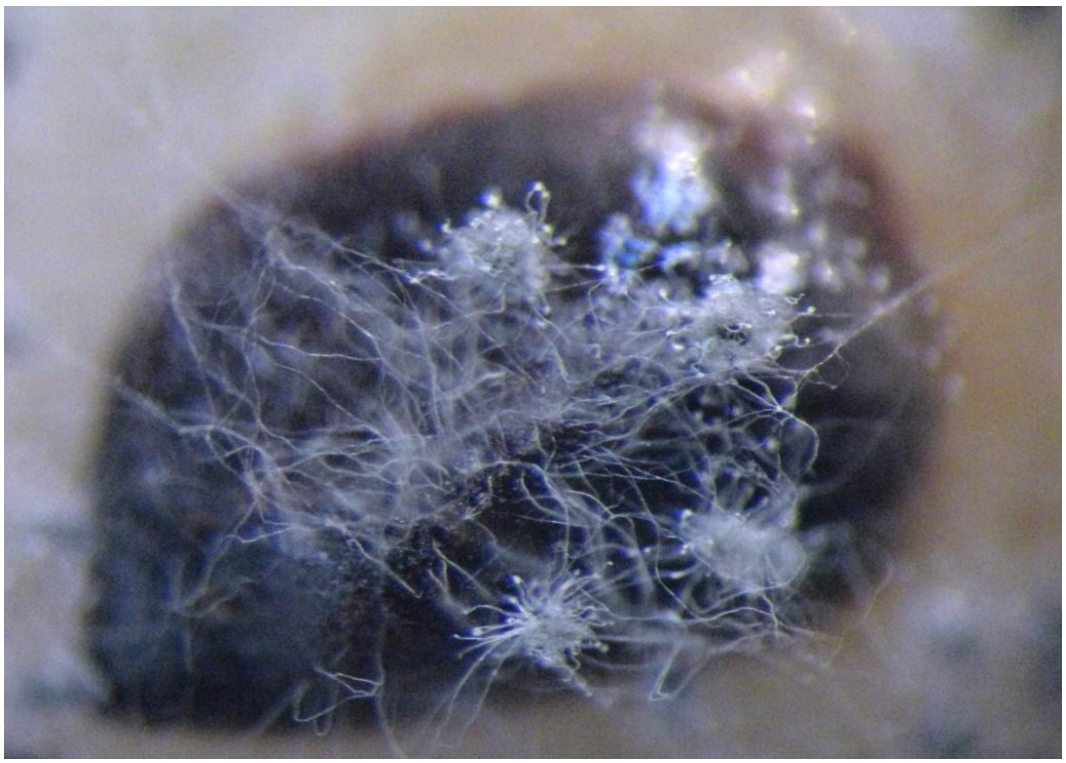

Plate.17. Seed infected with *Fusarium solani* observed under simple microscope

Plate. 18. *Rhizopus* spp infected jute seeds on filter paper observed under simple microscope

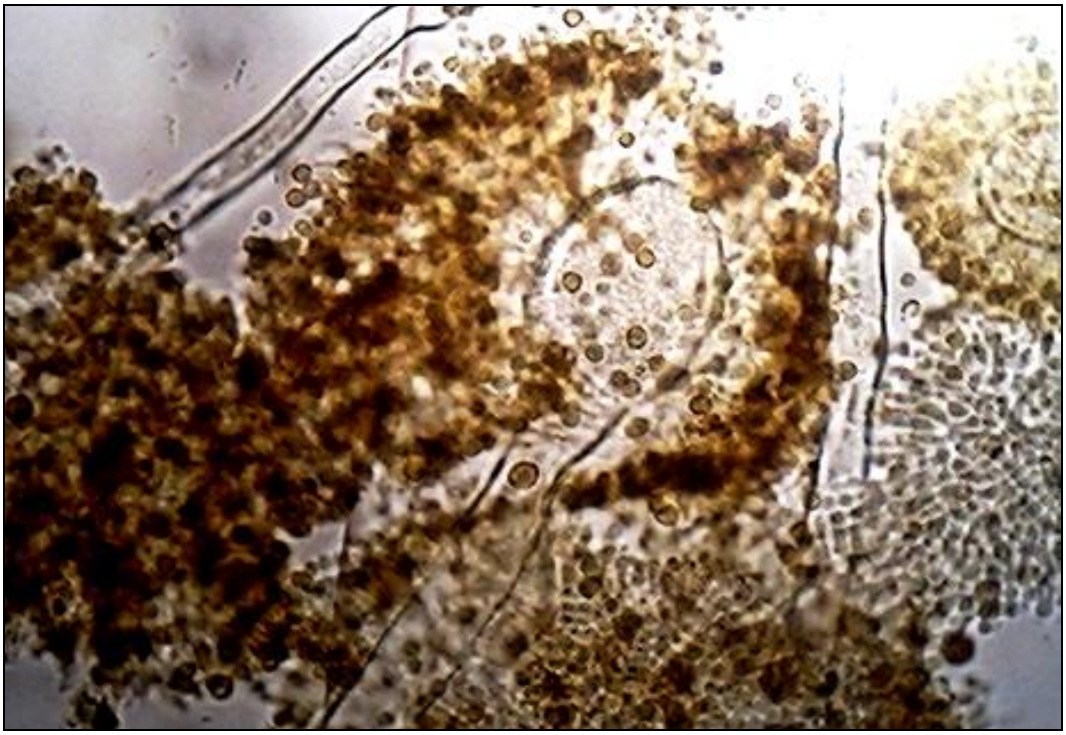

Plate. 19. *Rhizopus stolonifer* observed under compound microscope

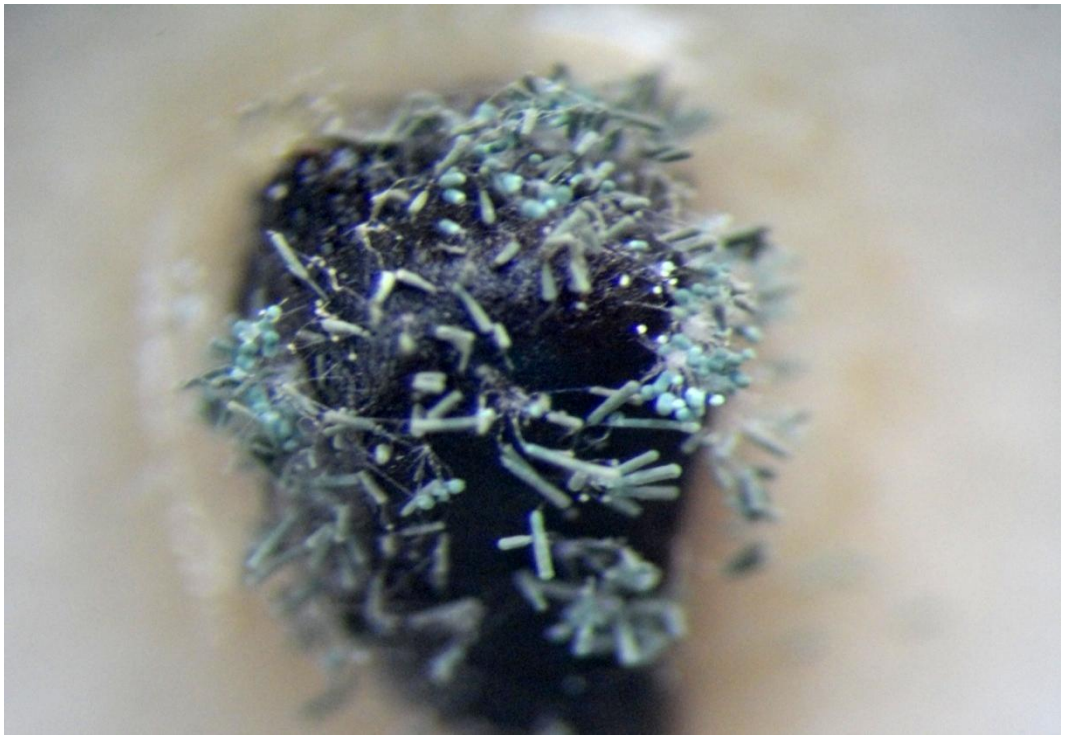

Plate. 20. *Penicillium* spp infected jute seed on Whatman Filter Paper observed under simple microscope

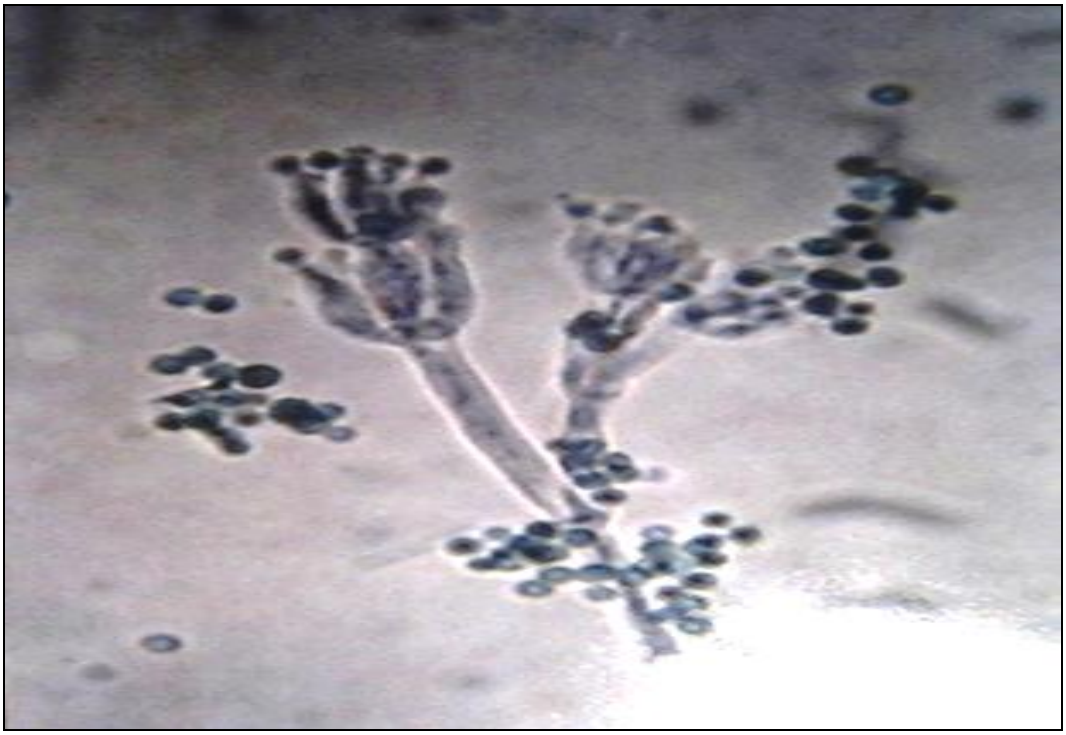

Plate. 21. *Penicillium* spp observed under compound microscope

Plate. 22. *Chaetomium* spp. observed under simple microscope

Plate. 23. Ring sign of *Chaetomium* spp. on filter paper observed under simple microscope

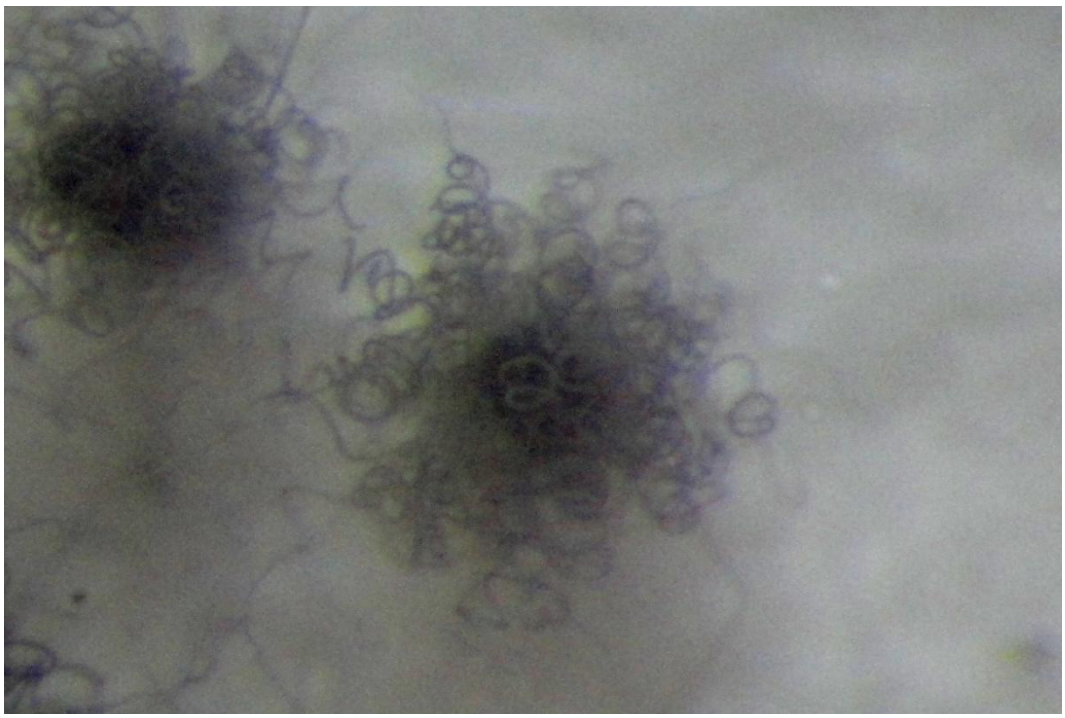

Plate. 24. Pycnidia of *Chaetomium* spp observed under simple microscope

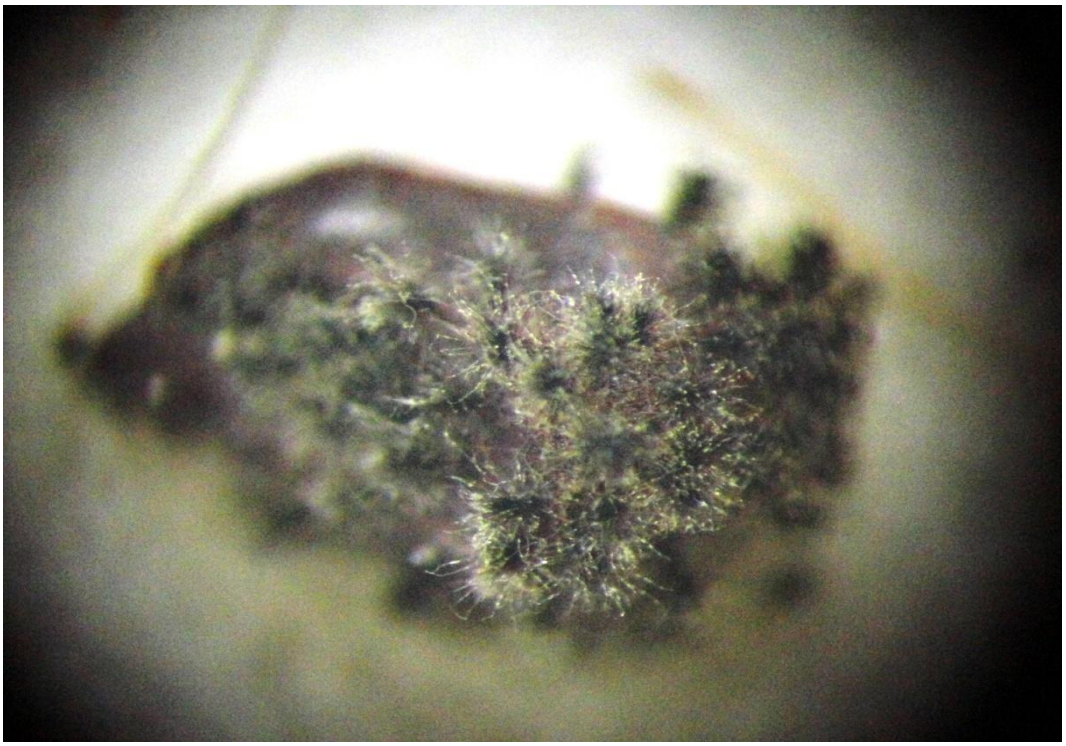

Plate 25. Pycnidia of *Chaetomium* spp. observed under simple microscope

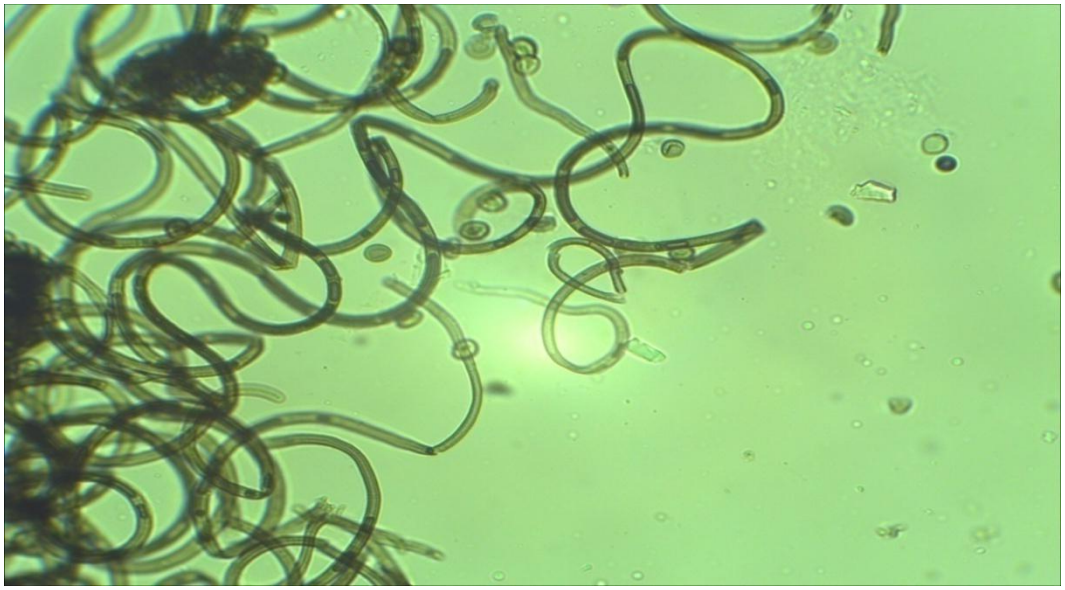

Plate. 26. Aleurospore of *Chaetomium* spp. observed under compound microscope

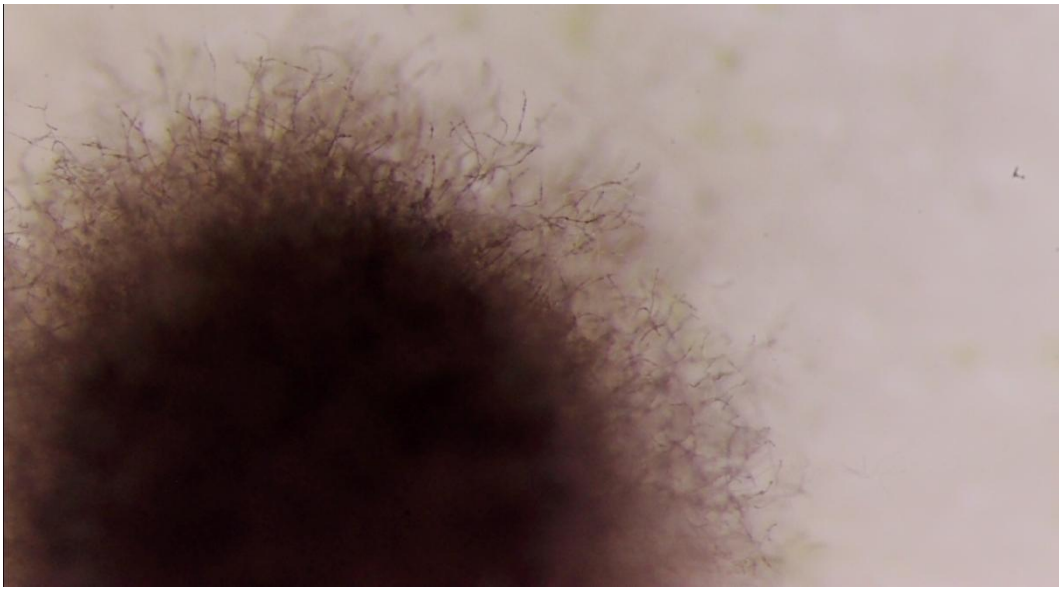

Plate 27. *Alternaria* spp. on jute seed observed under simple microscope

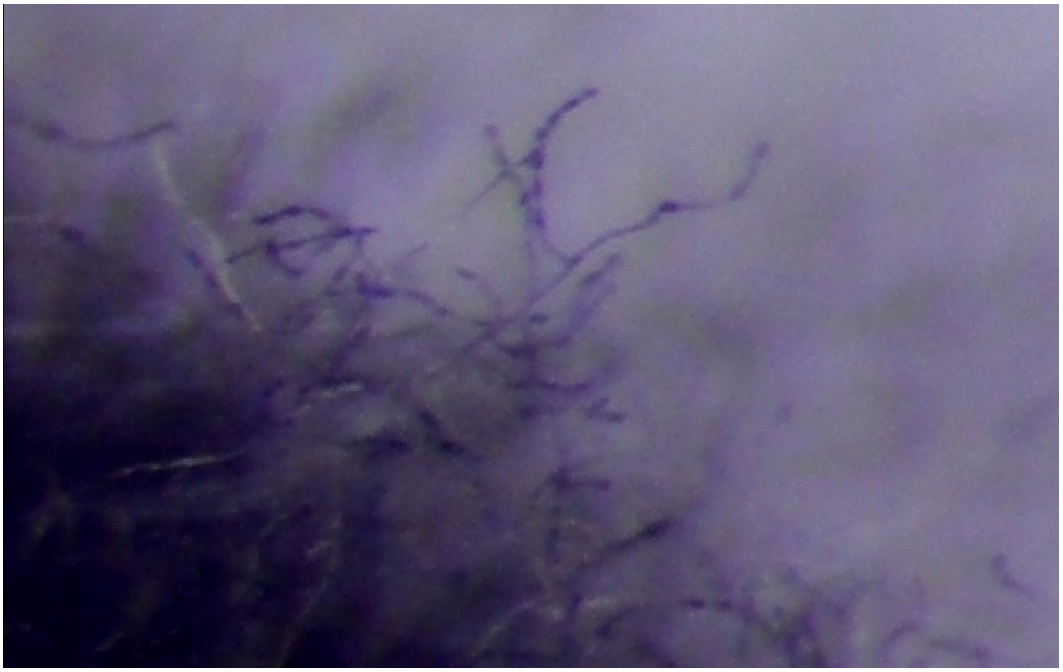

Plate. 28. *Alternaria* spp. on jute seed observed under simple microscope

Plate. 29. Conidia of *Alternaria* spp. observed under compound microscope

Plate. 30. *Carvularia* spp. on jute seed observed under simple microscope

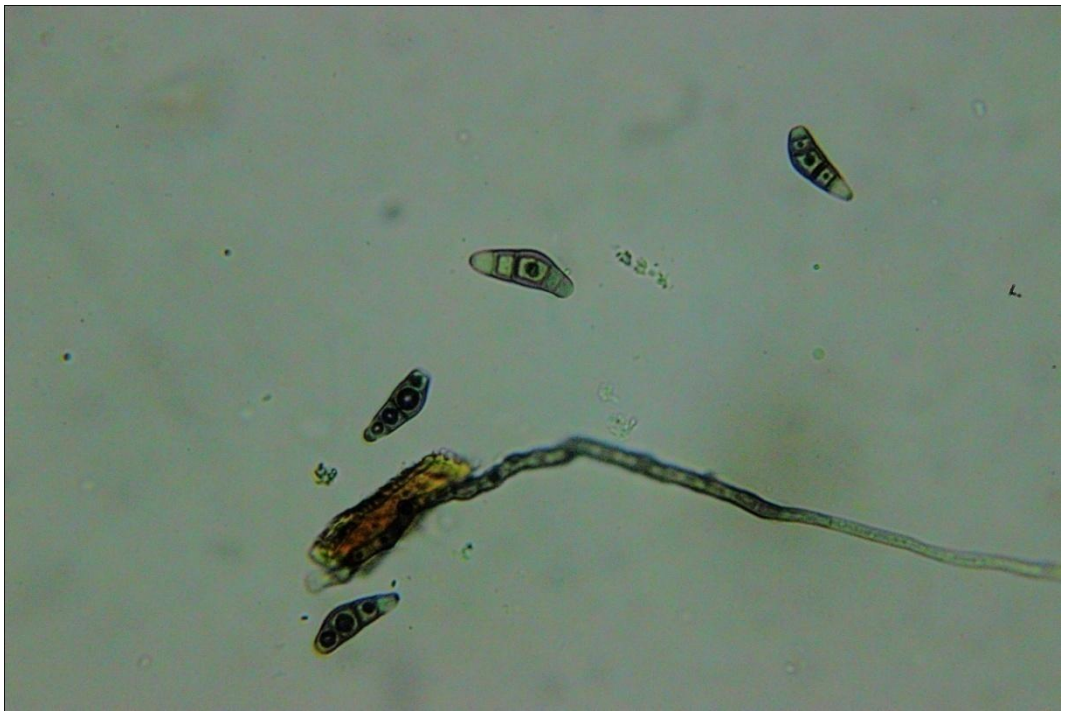

Plate. 31. Curved conidia of *Carvularia* spp. observed under compound microscope

Plate. 32. *Phoma* spp. on jute seed observed under simple microscope

4.1.1.2. Germination, seed borne infection of *Colletotrichum corchori* and disease in CVL-1 tested by seedling symptom test on water agar media in test tube.

Seedling symptom test in water agar media conducted with seed samples of 0.00%, 5.00%, 10.00%, 15.00%, 20.00% and 25.00% initial seed borne infection of *C. corchori* in the laboratory. Finding revealed that % germination, % post emergence infection, % germination failure and % total death for each initial infection varied significantly. The highest germination (96.00%) was recorded in 0.00% infected seeds and the lowest (73.00%) was recorded in 25.00% infected seeds. The highest post emergence infection (12.33%), germination failure (13.02%) and total death (25.35%) were recorded in case of 25.00% initial seed infection with *C. corchori*. For seeds infected with 0.00% initial seed borne infection of *C. corchori* no post emergence infection, germination failure and total death were found. (Table 4).

Table 4. Germination, seed borne infection of *Colletotrichum corchori* and disease in CVL-1 tested by seedling symptom test on water agar media in test tube.

% Initial infection of CVL-1 with *C. corchori*	% g*	% infection of CVL-1 with *C. corchori*		
		Post emergence infection	Germination failure	Total death (Pre and post emergence)
0.00	**96.00 a**	0.00 f	0.00 f	0.00 f
5.00	91.50 a	3.00 e	4.5 e	7.5 e
10.00	86.67 a	6.00 d	5.5 d	11.5 d
15.00	81.00 b	7.5 c	7.00 c	14.5 c
20.00	77.50 c	9.00 b	13.5 b	22.5 b
25.00	73.00 d	**12.33 a**	**13.02 a**	**25.35 a**
Level of significance	0.05	0.05	0.05	0.05

*germination

Data in column having common letter(s) do not differ significantly.

4.1.2. Greenhouse Experiments

4.1.2.1. Incidence of anthracnose at different times after sowing of seeds with different initial %infection of *C. corchori.*

Findings reveals that the lowest initial seed borne infection resulted the lowest incidence of anthracnose and the highest initial seed borne infection resulted the highest incidence of anthracnose. It is also evident that all the samples having different percentages of *Colletotrichum corchori* (0%, 5%, 10%, 15%, 20% and 25%) resulted continuous increasing trend of infection with anthracnose with the increase of plant growth. (Figure.1).

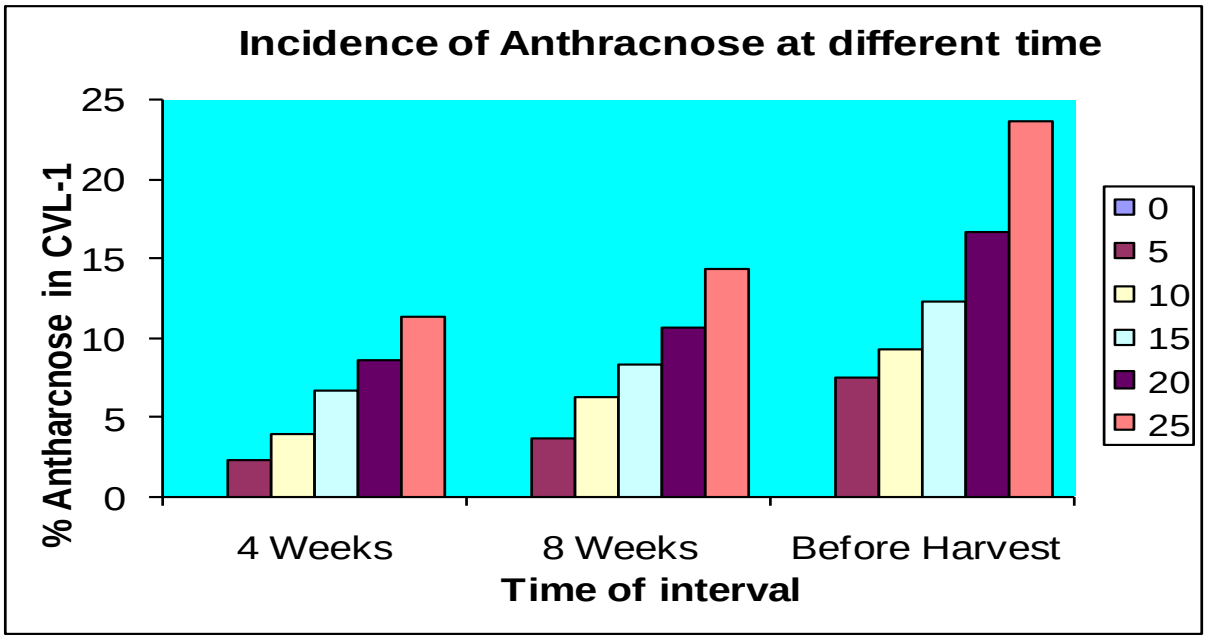

Figure. 1: Graphical presentation of incidence of Anthracnose in CVL-1 at different time

4.1.2.2. Effect of initial seed borne infection *of Colletotrichum corchori* on seed yield parameters of CVL-1 in greenhouse

Seed yield parameters viz. number of plants/pot, number of pods/pot and number of pods/plant varied significantly for seed samples with initial seed borne infection with 0.00%, 5.0%, 10.00%, 15.00%, 20.00% and 25.00% of *C. corchori.* The highest number of plant/pot (24.25), number of pods/pot (704.50) and number of pods/plant (29.70) were recorded by 0.0% initial seed borne infection of *C. corchori.* The lowest number of plant/pot (14.33), number of pods/pot (293.25) and number of pods/plant (18.41) was recorded in case of 25.00% initial seed borne infection of *C. corchori.* Plant/pot, number of pods/pot and number of pods/plant were decreased with the increase of initial seed borne infection of *C. corchori* (Table 5).

Table 5: Effect of initial seed borne infection *of Colletotrichum corchori* on seed yield parameters of CVL-1 in greenhouse

Initial seed borne infection of *C. corchori*	**Mean Seed yield parameters of CVL-1**		
	No. of Plant/ Pot	**No. Pods / Pot**	**No. of Pods/Plant**
0.0%	**24.25 a**	**704.50 a**	**29.70 a**
5%	22.13 b	613.88 b	27.77 b
10%	20.63 c	484.50 c	23.57 c
15%	18.50 d	375.88 d	20.45 d
20%	16.00 e	337.50 e	20.00 d
25%	14.33 f	293.25 f	18.41e
Level of significance	0.05	0.05	0.05

*germination

Data in column having common letter(s) do not differ significantly.

4.1.2.3 Effect of initial seed borne infection *of Colletotrichum corchori* on Seeds/Pod and Seeds/Plant of CVL-1 produced in greenhouse

Seed yield parameters viz. number of seeds/pod and number of seeds/plant varied significantly for seed samples with initial seed borne infection of 0.00%, 5.0%, 10.00%, 15.00%, 20.00% and 25.00% of *C. corchori.* The highest number of seeds/pod (45.58) and number of seeds/plant (1323.22) were recorded by 0.0% initial seed borne infection of *C. corchori.* The lowest number seeds/pod (25.81) and seeds/plant (472.53) was recorded in case of 25.00% initial seed borne infection of *C. corchori.* Seeds/pod and seeds/plant were decreased with the increase

of initial seed borne infection of *C. corchori.* The highest % reduction of seeds/pod (43.37%) and % reduction of seeds/plant (64.29%) was recorded for 25.00% initial seed borne infection of *C. corchori.* The lowest % reduction seeds/pod (10.14%) and % reduction of seeds/plant (14.49%) was recorded in case of 5.00% initial seed borne infection of *C. corchori.* (Table 6).

Table 6: Effect of initial seed borne infection *of Colletotrichum corchori* on Seeds/Pod and Seeds/Plant of CVL-1

Initial seed borne infection of *C. corchori*	Seed yield parameters of CVL-1			
	No. of Seeds/Pod	% reduction of Seeds/Pod	No. of Seeds/Plant	% reduction of Seeds/Plant
0.0%	45.58 a		1323.22 a	
5%	40.96 b	10.14	1131.47 b	14.49
10%	37.59 c	17.53	881.58 c	33.38
15%	34.84 d	23.56	710.62 d	46.30
20%	30.70 e	32.65	609.00 e	53.98
25%	25.81 f	43.37	472.53 f	64.29
Level of significance	0.05		0.05	

Data in column having common letter(s) do not differ significantly.

4.1.2.4 Effect of initial seed borne infection of *C. corchori on* quality of the harvested seeds of CVL-1 produced in greenhouse

Germination of the harvested seeds with initial seed borne infection of 0.00%, 5.0%, 10.00%, 15.00%, 20.00% and 25.00% of *C. corchori* varied significantly. The highest germination (98%) was recorded in seeds

harvested from 0.00% initial seed borne infection of *C. corchori* followed by 93.50% germination of seeds from 5.00 % initial seed borne infection and the lowest germination (70.00%) was recorded in seeds from 25.00% initial seed borne infection. The lowest germination (70.00%) and the highest infection with *C. corchori* (22.00%) were recorded for 25.00% initial seed borne infection of *C. corchori* and number of infection was recorded for 0.0% initial seed borne infection of *C. corchori.* Germination was decreased with the increase of initial seed borne infection of *C. corchori* and infection with *C. corchori* increased with the increase of initial seed borne infection of *C. corchori* (Table 7).

Table7: Effect of initial seed borne infection of *C. corchori* on quality of the harvested seeds of CVL-1 produced in greenhouse

% Initial level of seed-borne infection of *C. c.*	% g	% Pathogen						
		C. c.	***M.p.***	***B. t.***	***F.* spp.**	***A.* spp.**	***P.* spp.**	**Total**
(T_1) 0.00	**98.00 a**	0.00 f	0.00 d	0.00 c	3.33 e	2.00 d	1.33 bc	6.66 e
(T_2) 5.00	93.50 b	3.33 e	0.00 d	0.00 c	4.50 d	3.33 c	2.50 b	13.66 d
(T_3) 10.00	87.00 c	7.67 d	3.33 c	2.33 ab	6.67 bc	4.33 bc	0.00 d	24.33 c
(T_4) 15.00	83.00 d	12.00 c	0.00 d	1.67 b	7.00 b	5.67 ab	1.33 bc	27.67 c
(T_5) 20.00	77.00 e	16.67 b	4.67 b	3.33 a	5.33 c	**6.33 a**	4.33ab	40.66 b
(T_6) 25.00	70.00 f	**22.00 a**	**5.33 a**	**3.67 a**	**9.67 a**	3.33 c	**6.67 a**	**49.67 a**
Level of significance	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05

*germination

C.c. = Colletotrichum corchori
M.p.= Macrophomina phasiolina
B.t.= Botryodiplodia theobromae
F. spp. = *Fusarium* spp.
A. spp. = *Aspergillus* spp.
P. spp. = *Penicillum* spp.

Data in column having common letter(s) do not differ significantly.

4.1.2.5. Relationship of initial seed borne infection of *C. corchori* on seed yield parameters of the harvested seeds of CVL-1 produced in greenhouse

Relationship of initial seed borne infection of *Colletotrichum corchori* with germination, plant/pot, seeds/pod, seeds/plant, dead seeds, total dead seeds, infected seedlings, and infection of *Colletotrichum corchori* in

harvested seeds of CVL-1 in Greenhouse were determined using regression equations and regression lines. Regression line of Figure. 2, 3, 4 and 5 evident that the relationship between initial seed borne infection of *Colletotrichum corchori* with % germination, plants/pot, seeds/pod and seeds/plant, respectively, were negative. The regression coefficients for % germination, plant/pot, seeds/pod and seeds/plant were -1.2429, -0.4006, -0.7564 and -34.329, respectively which indicate that germination rate decreased by 1.24%, Plants/pot decreased by 0.40, seeds/pod decreased by 0.76 and seeds/plant decreased by 34.33 for each % increase of initial seed borne infection of *C. corchori*. (Figures 2, 3,4 and 5).

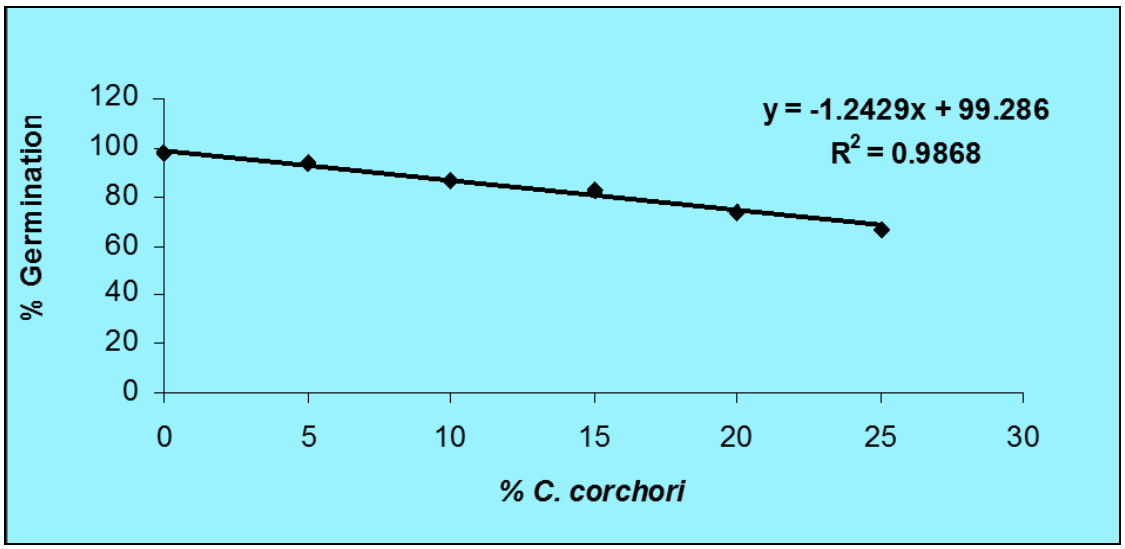

Figure. 2. Relationship of initial seed borne infection of *Colletotrichum corchori* with germination of jute seeds in greenhouse.

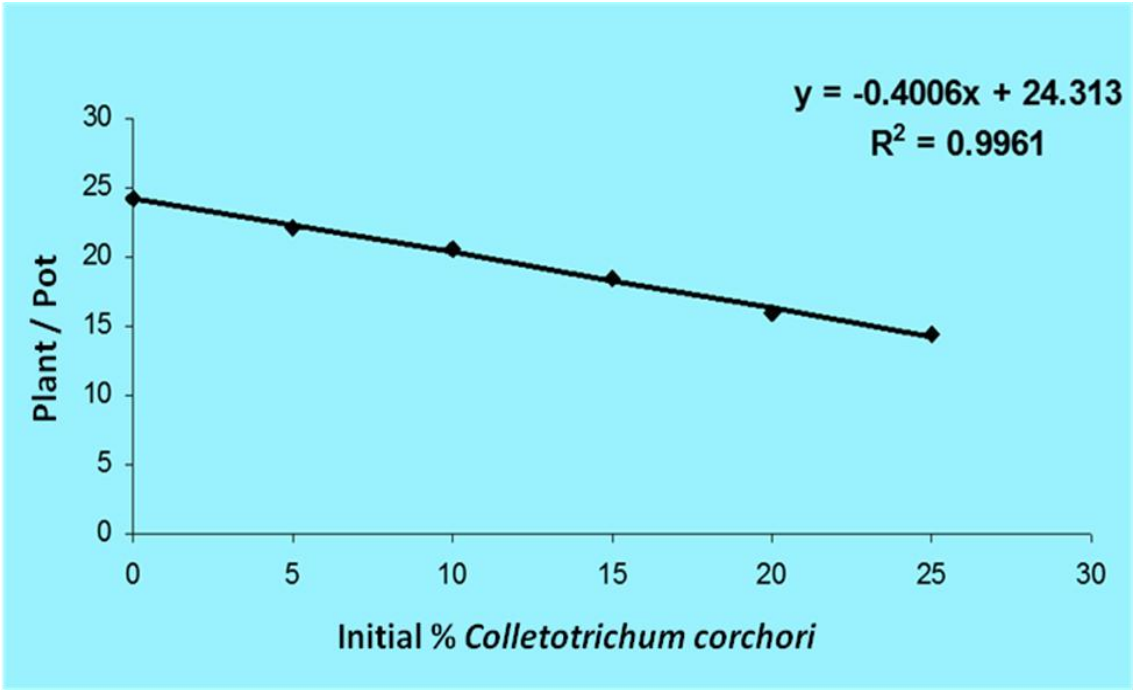

Figure.3. Relationship of initial % *Colletotrichum corchori* with plant per pot in greenhouse.

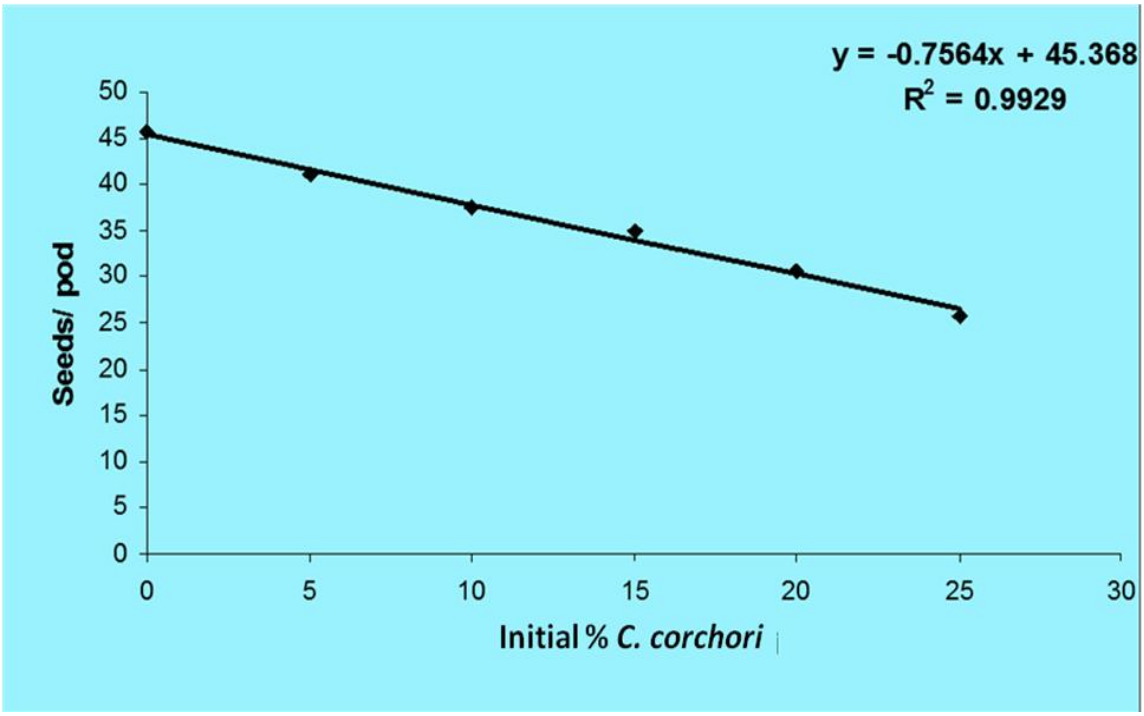

Figure.4. Relationship of initial % *Colletotrichum corchori* with seeds per pod in greenhouse.

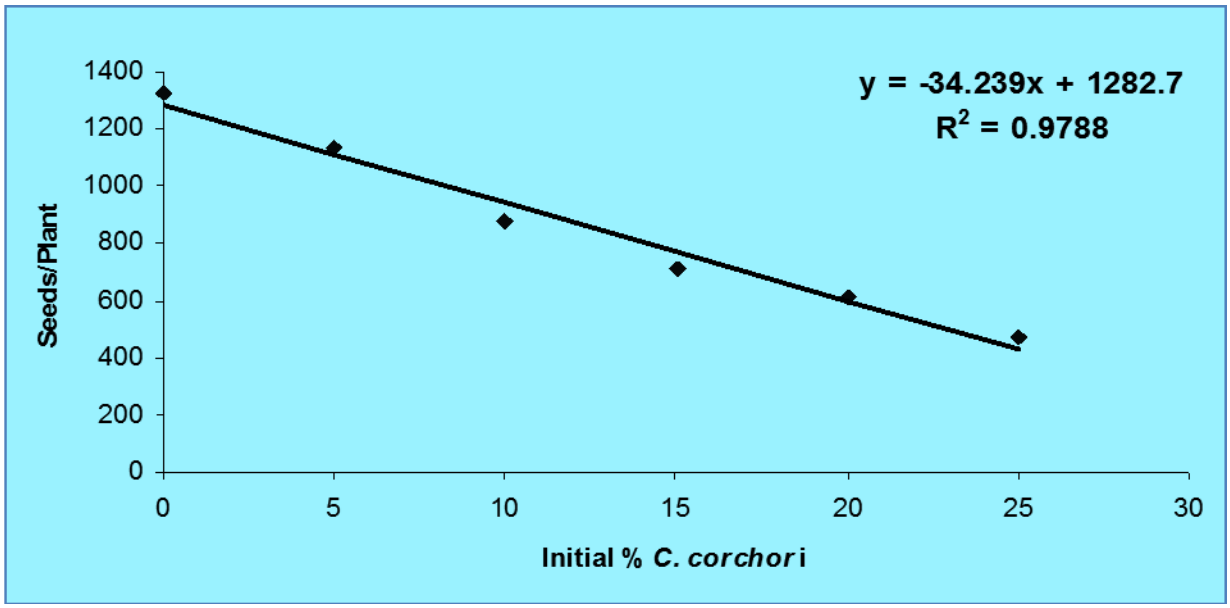

Figure.5. Relationship between initial % *Colletotrichum corchori* and seeds per plant in greenhouse.

Regression line of Figure. 6, 7, 8 and 9 showed that the relationship between initial seed borne infection of *Colletotrichum corchori* with % dead seeds, total dead seeds and % infected seedlings were positive. The regression coefficients for % dead seeds, total dead seeds and % infected seedlings were 0.5665, 0.7514 and 0.486, respectively which indicates that rate of increase of % dead seeds increased by 0.55%, total dead seeds increased by 0.75 and % infected seedlings increased by 0.49% for each % increase of initial seed borne infection of *C. corchori*. (Figures 6, 7 and 8).

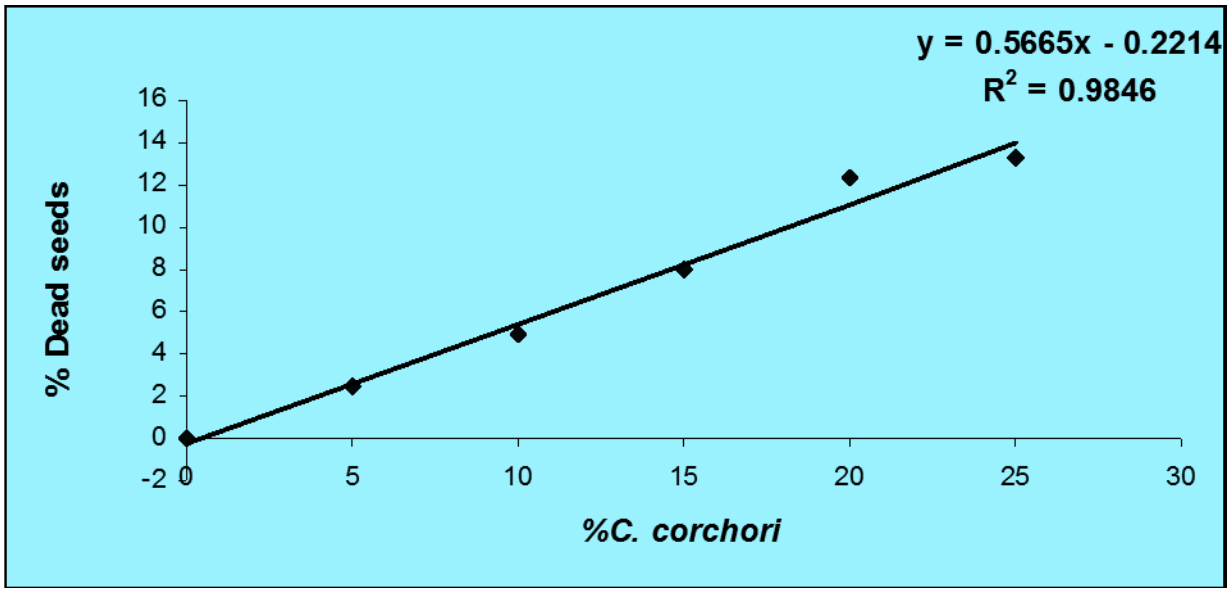

Figure 6. Relationship between initial seed borne infection of *Colletotrichum corchori* and % dead seeds due to *Colletotrichum corchori* in greenhouse.

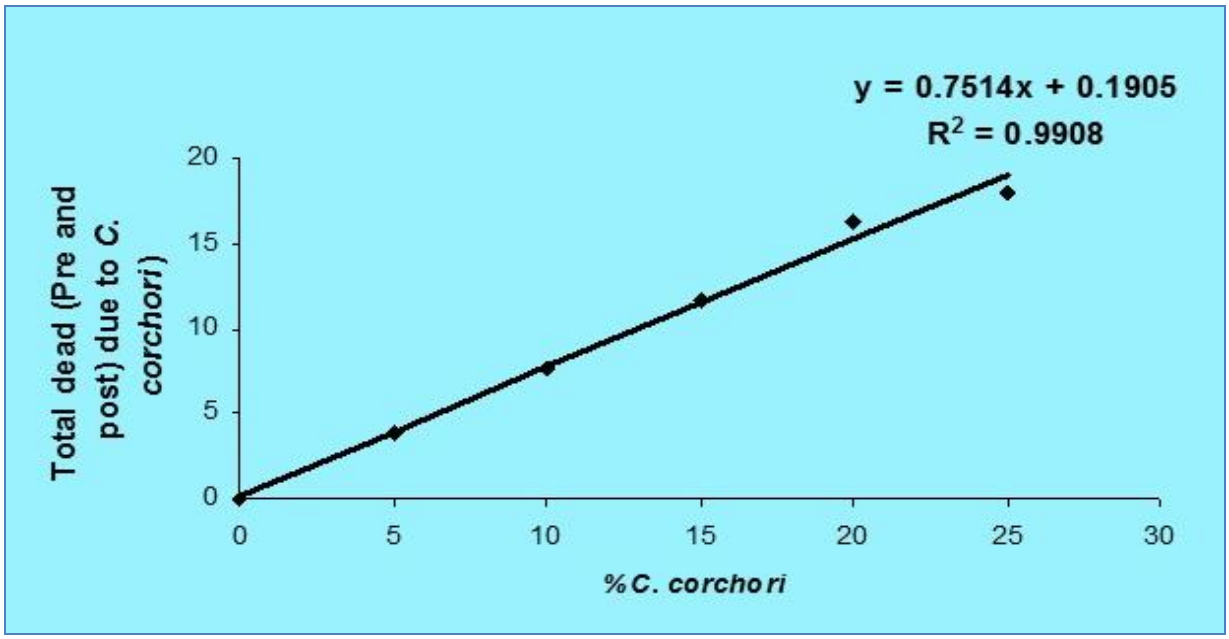

Figure.7. Relationship between initial seed borne infection of *Colletotrichum corchori* and total dead seeds (pre and post emergence) due to *Colletotrichum corchori* in greenhouse.

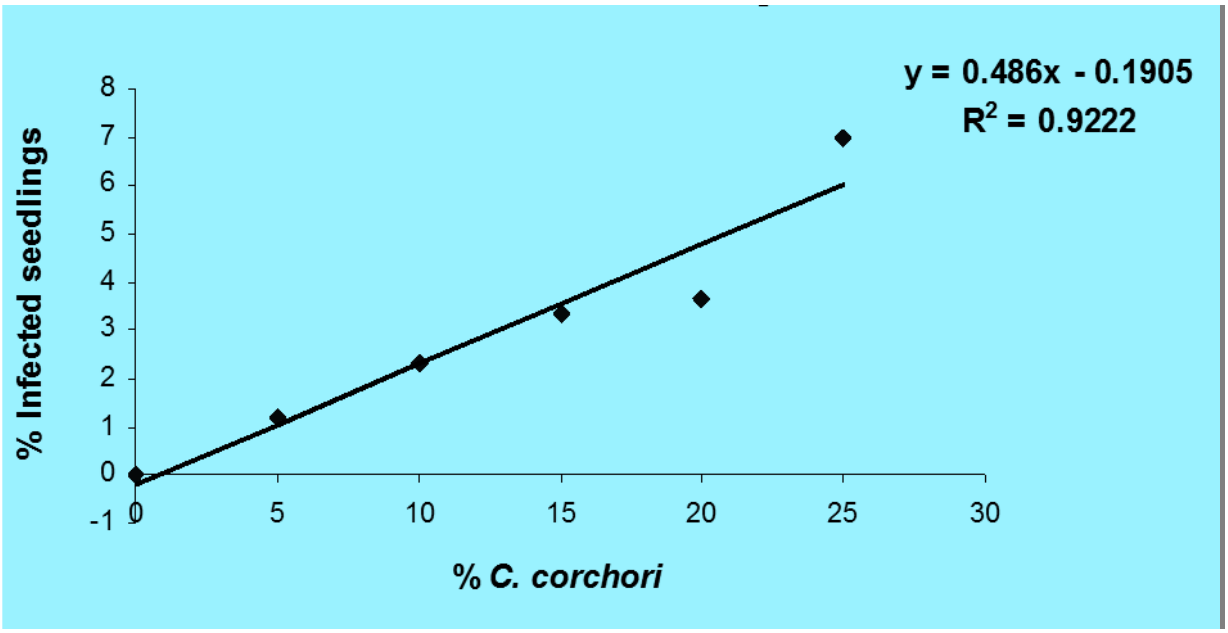

Figure.8. Relationship between initial seed borne infection of *Colletotrichum corchori* and % infected seedlings due to *C. corchori* in greenhouse.

4.1.2.6. Transmission of *Colletotrichum corchori* from seed to seed

Regression line of Figure 9 showed that the relationship between initial seed borne infection of *Colletotrichum corchori* with seed borne infection of *C. corchori* in harvested seed was positive. The regression coefficients for % infection of *C. corchori* in harvested seeds at greenhouse was 0.882%, which indicates that rate the rate of transmission of % infection of *C. corchori* in harvested seeds at greenhouse was 0.882% for each % increase of initial seed borne infection of *C. corchori*. (Figure 9).

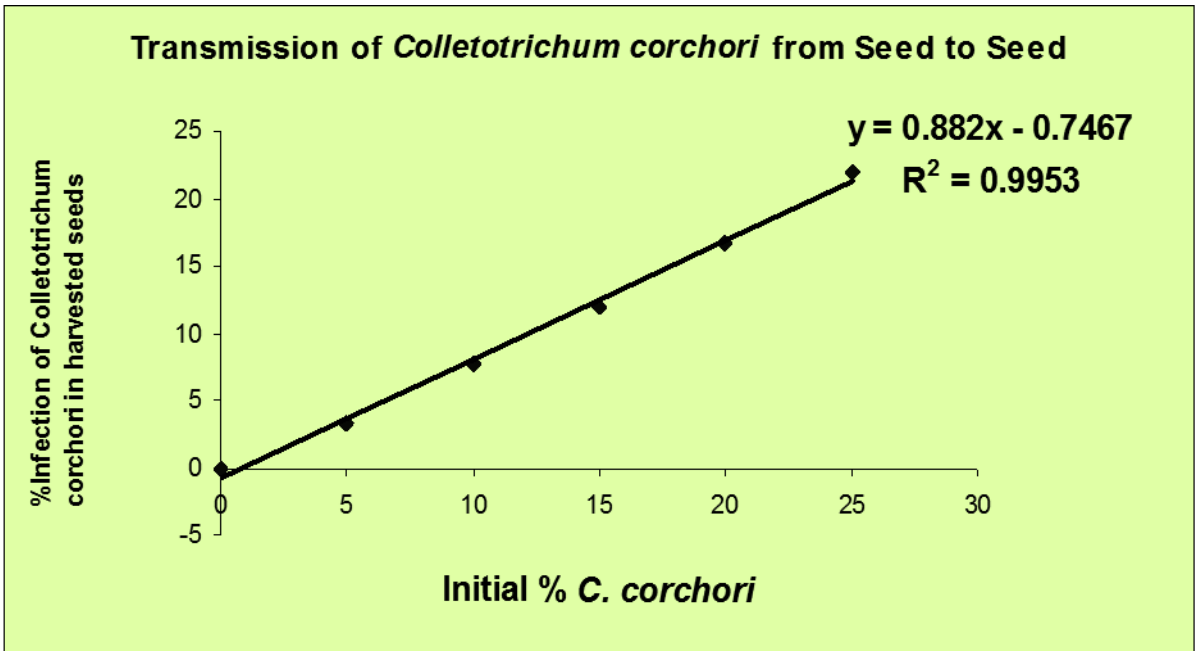

Figure.9. Transmission of *Colletotrichum corchori* from seed to seed

4.1.3. Field Experiments

4.1.3.1. Effect of initial seed borne infection of *Colletotrichum corchori* on germination of CVL-1 under field condition

Percent germination of seeds under field condition with initial seed borne infection of 0.00%, 5.0%, 10.00%, 15.00%, 20.00% and 25.00% of *C. corchori* varied significantly. The highest germination (98.00%) was recorded at JAES followed by germination (96.00%) at Chandina Regional Station of BJRI for 0.0% initial seed borne infection of *C. corchori.* The lowest germination (65.33%) was recorded at Chandina Regional Station of BJRI, preceded by germination (70.53%) at JAES for 25.00% initial seed borne infection of *C. corchori.*

The highest % germination reduction (32.00%) was recorded at Chandina Regional Station of BJRI followed by germination (28.03%) at JAES for 25.00% initial seed borne infection of *C. corchori.* The lowest germination reduction (6.27%) was recorded at JAES, preceded by germination (9.38%) at Chandina Regional Station of BJRI for 5.00% initial seed borne infection of *C. corchori* (Table 8).

Table 8: Effect of initial seed borne infection of *Colletotrichum corchori* on germination of CVL-1 under field condition

% Initial seed borne infection of *C. corchori*	**% Germination at Field**			
	JAES		**Chandina**	
	% g*	**% g* reduction**	**% g***	**% g* reduction**
0.0%	**98.00 a**		**96.00 a**	
5%	91.86 b	6.27	87.00 b	9.38
10%	86.12 c	12.12	81.33 c	15.28
15%	80.53 d	17.83	76.33 d	20.49
20%	76.50 e	25.00	70.00 e	27.08
25%	**70.53 f**	28.03	**65.33 f**	32.00
Level of significance	0.05		0.05	

*germination

Data in column having common letter(s) do not differ significantly.

4.1.3.2. Effect of initial seed borne infection of *Colletotrichum corchori* on seed yield of CVL-1 under field condition

Seed yield under field condition with initial seed borne infection of 0.00%, 5.0%, 10.00%, 15.00%, 20.00% and 25.00% of *C. corchori* varied significantly. Seed yield decreased with the increase of initial seed borne infection of *C. corchori*. The highest seed yield (814.67kg/ha) recorded at JAES followed by seed yield (801.33 kg/ha) at Chandina regional station of BJRI for 0.0% initial seed borne infection of *C. corchori.* The lowest seed yield (575.67 kg/ha) was recorded at Chandina regional station of BJRI, preceded by seed yield (625.00 kg/ha) at JAES for 25.00% initial seed borne infection of *C. corchori.*

The highest % seed yield reduction (28.16%) was estimated in Chandina regional station of BJRI followed by seed yield reduction (23.28%) in JAES by 25.00% initial seed borne infection of *C. corchori.* The lowest % seed yield reduction (2.98%) was recorded at JAES, preceded by % seed yield reduction (3.41%) at Chandina regional station of BJRI in case of 5.00% initial seed borne infection of *C. corchori* (Table .9).

Table 9: Effect of initial seed borne infection of *Colletotrichum corchori* on seed yield of CVL-1 under field condition

% Initial seed borne infection of *C. corchori*	JAES		Chandina	
	Seed Yield (Kg/ ha.)	% Seed yield reduction	Seed Yield (Kg/ ha.)	% Seed yield reduction
0.0%	814.67 a		801.33 a	
5%	790.33 b	2.98	774.98 b	3.41
10%	730.00 c	10.39	698.33 c	12.85
15%	705.33 d	13.42	653.00 d	18.51
20%	657.67 e	19.27	625.00 e	22.00
25%	625.00 f	23.28	575.67 f	28.16
Level of significance	0.05		0.05	

Data in column having common letter(s) do not differ significantly.

4.1.3.3. Percent seed borne infections with *C. corchori* in harvested seeds of CVL-1 of different locations

Percent seed borne infection in harvested seeds under field condition varied significantly with initial seed borne infection of 0.00%, 5.0%, 10.00%, 15.00%, 20.00% and 25.00% of *C. corchori* varied significantly.

The highest % seed borne infection (30.00%) with *C. corchori* in harvested seeds was recorded at Chandina Regional Station of BJRI followed by seed borne infection (24.00%) at JAES for 25.00% initial seed borne infection of *C. corchori.* The lowest seed borne infection

(3.33%) with *C. corchori* in harvested seeds was recorded at JAES, preceded by seed borne infection (5.00%) at Chandina Regional Station of BJRI for 5.00% initial seed borne infection of *C. corchori.* No seed borne infection of *C. corchori* was recorded in seeds harvested with 0.00% initial seed borne infection of *C. corchori.*

The highest % total pathogen (36.17%) was recorded at Chandina Regional Station of BJRI followed by total pathogen (29.17%) at JAES for 25.00% initial seed borne infection of *C. corchori.* The lowest % total pathogen (2.50%) was recorded at JAES, preceded by % seed total pathogen (2.67%) at Chandina Regional Station of BJRI for 0.00% initial seed borne infection of *C. corchori* (Table 10).

Table 10: Percent seed borne infections with *C. corchori* in harvested seeds of CVL-1 of different locations

% Initial seed borne infection of *C. corchori*	JAES		Chandina	
	% *C. corchori*	% Total pathogens	% *C. corchori*	% Total pathogens
0.0%	**0.00 e**	**2.50 e**	**0.00 e**	**2.67 e**
5%	3.33 d	5.00 d	5.00 d	12.00 d
10%	8.67 c	14.00 c	10.50 c	17.33 c
15%	14.63 c	19.50 c	17.00 c	24.50 c
20%	19.50 b	24.00 b	26.50 b	26.00 b
25%	**24.00 a**	**29.17 a**	**30.00 a**	**36.17 a**
Level of significance	0.05	0.05	0.05	0.05

*germination

Data in column having common letter(s) do not differ significantly.

4.1.3.4. Relationship of initial seed borne infection of *C. corchori* on seed yield parameters of the harvested seeds of CVL-1 produced at different locations

Regression lines of Figure 9 showed that the relationship between initial seed borne infection of *Colletotrichum corchori* with % germination were negative. The regression coefficients for % germination of harvested seeds produced at JAES, Manikgonj and Chandina were -0.9739 and -1.069, respectively indicating % germination of hervested seeds decreased by 0.97% at JAES and 1.07% at Chandina for each % increase of initial seed borne infection of *C. corchori*. (Figure 10).

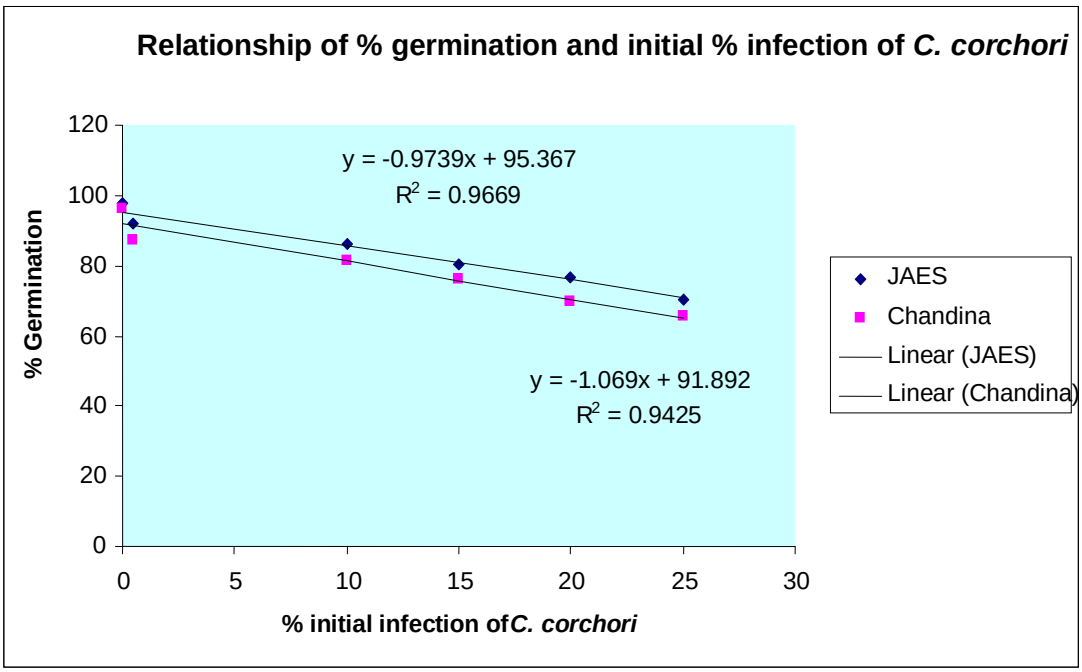

Figure.10. Regression Equation and lines for % germination and % initial infection of *C.corchori* under field condition

Regression lines of Figure 11 showed that the relationship between initial seed borne infection of *Colletotrichum corchori* with seed yield (kg/ha) were negative. The regression coefficients for seed yield of harvested seeds produced at JAES, Manikgonj and Chandina were -7.8343(kg/ha) and -9.2775 (kg/ha), respectively which indicates that rate of decrease of seed yield of harvested seeds decreased by 7.83 at JAES and 9.28% at Chandina for each % increase of initial seed borne infection of *C. corchori*. (Figure. 11).

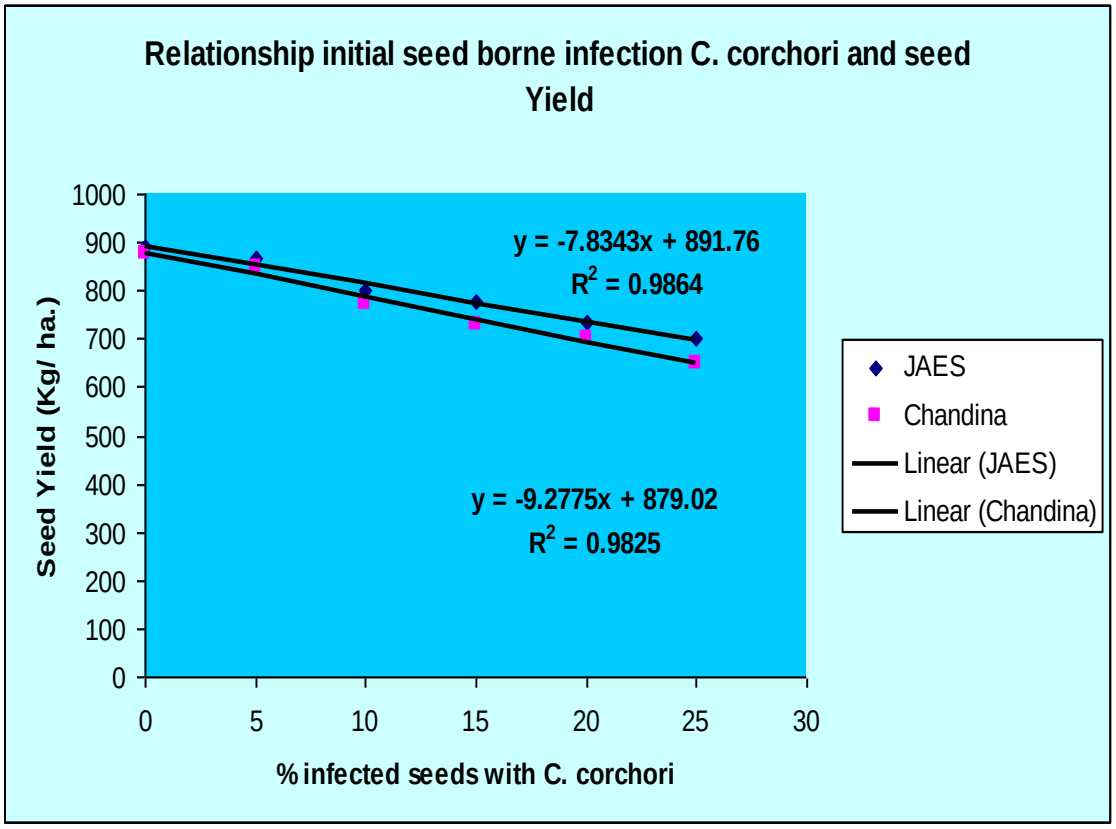

Figure. 11: Regression lines and equations Initial infection of *C. Corchori* and Seed at JAES and Chandina

4.1.3.5. Transmission of *Colletotrichum corchori* from seed to seed under field condition

Regression lines of Figure. 12 indicate that the relationship between initial seed borne infection of *Colletotrichum corchori* with %infection of *C. corchori* in harvested seeds at JAES, Manikgonj and Chandina were positive. The regression coefficients for %infection of *C. corchori* in harvested seeds were 1.0465% and 1.3229% for JAES and Chandina, respectively. Findings evident that the rate of transmission of % infection of *C. corchori* in harvested seeds at JAES and Chandina were 1.05% and

1.32%, respectively for each % increase of initial seed borne infection of *C. corchori*. (Figure. 12).

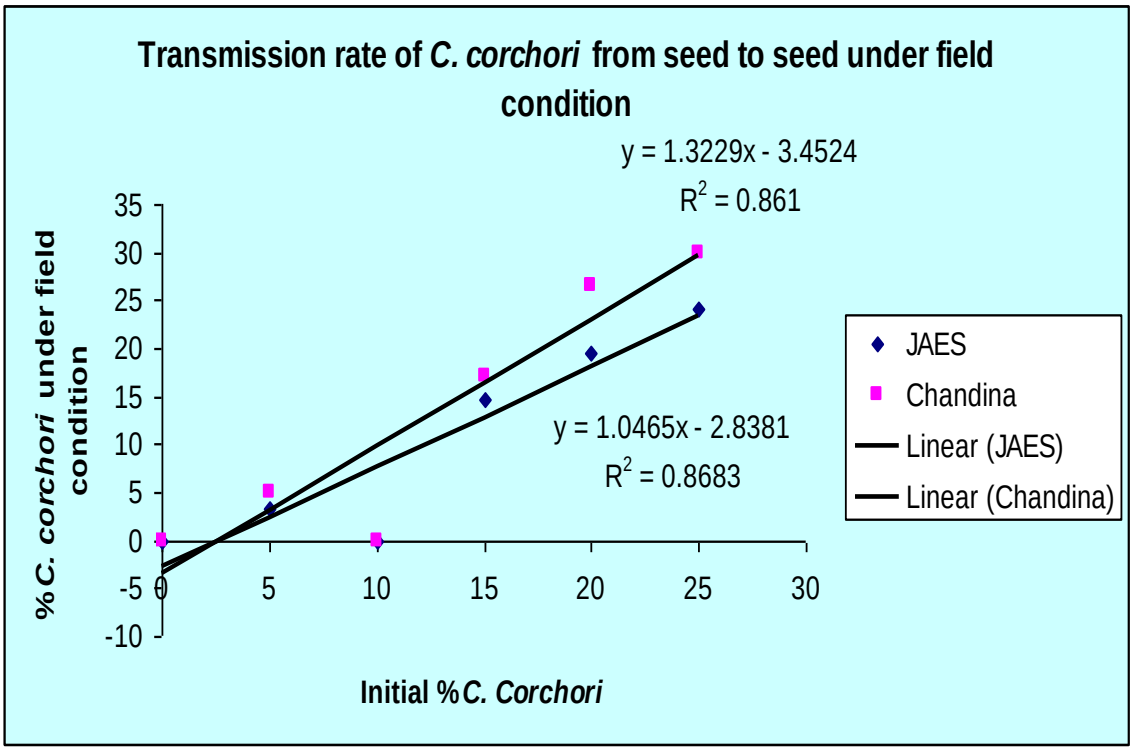

Figure. 12: Regression equations and lines transmission of C. corchori from seed to seed

CHAPTER 5

DISCUSSION

5. DISCUSSION

Altogether 600 seed samples of jute variety CVL-1 under four seed tires namely breeder seed (15), foundation seed (5), certified seed (7) and farmers' seeds (573) collected from 6 locations of BJRI, 2 seed production zones of BADC, 6 regions of BADC and 24 jute growing regions of Bangladesh, respectively (Table 1). Collected seed samples were subjected to germination and health test in the laboratory of Plant Pathology Department, BJRI and seed samples from all seed tires were categorized on the basis of seed borne infection of *Colletotrichum corchori* as 0%, 5%, 10%, 15%, 20% and 25% in addition, seed to plant to seed transmission of *C. corchori* was studied.

Percent germination and pathogens found in different seed samples collected from different locations of Bangladesh varied from 67.33% to 96.00% depending on the seed tiers, jute varieties and collection of seed sources. Germination of seeds varied significantly and the lowest (67.33%) was in farmers' seeds and the highest (96.00%) in breeder seeds. The total mean seed borne fungal infections recorded in the study varied from 3.55 to 37.99% in different seed tiers and seed sources. The highest seed borne infection (37.99%) with lowest germination (67.33%)

was recorded in CVL-1 of farmers' seed and the lowest seed borne infection (3.55%) with the highest germination (96.00%) recorded in CVL-1 of breeder seed. Findings evident that seeds having higher level of seed-borne infection of the pathogen may cause risk as regard to germination reduction. Haque, *et al.* (1999) reported that least prevalence of seed borne infection of fungal pathogens in breeder seeds and highest in farmers' seeds collected from different sources of Bangladesh.

Seedling symptom test in water agar media was conducted with seed samples having 0.00%, 5.00%, 10.00%, 15.00%, 20.00% and 25.00% initial seed borne infection of *C. corchori* in the laboratory. Findings revealed that the highest germination (96.00%) was recorded in 0.00% initial seed borne infection of *C. corchori* and the lowest germination (73.00%) was recorded in 25.00% initial seed borne infection of *C. corchori.* The highest post emergence infection (12.33%), germination failure (13.02%) and total death (25.35%) were recorded in case of 25.00% initial seed borne infection of *C. corchori* and no post emergence infection, germination failure and total death were recorded in case of 0.00% initial seed borne infection of *C. corchori*. According to Akanda and Fakir (1985 b), low germination was recorded to high prevalence of pathogens which is in consonant with the present study.

Greenhouse study on the incidence of anthracnose at different time after sowing of seeds with different initial % infections of *C. corchori* revealed that all the samples had continuous increasing trend with the increase of time of plant growth. Zadoks and Schein (1977) reported that the infection foci in a plot increased with the increase of time.

Seed yield parameters in green house viz. plants/pot, pods/pot, pods/plant, seeds/pod and seeds/plant varied significantly and decreased with increase of initial seed borne infection of 0.00%, 5.0%, 10.00%, 15.00%, 20.00% and 25.00% of *C. corchori.* The highest no. of plants/pot (24.25), no. of pods/pot (704.50) and no. of pods/plant (29.70) were recorded for 0.0% initial seed borne infection of *C. corchori.* The lowest no. of plant/pot (14.33), no. of pods/pot (293.25) and no. of pods/plant (18.41) was recorded in case of 25.00% initial seed borne infection of *C. corchori.* The highest no. of seeds/pod (45.58) and no. of seeds/plant (1323.22) were recorded for 0.0% initial seed borne infection of *C. corchori.* The lowest no. seeds/pod (25.81) and no. of seeds/plant (472.53) was recorded in case of 25.00% initial seed borne infection of *C. corchori*. Relationships of initial seed borne infection of *C.corchori* and seed yield parameters of the harvested seeds of CVL-1 produced in greenhouse were negative**.** The regression coefficients for %germination,

plants/pot, seeds/pod and seeds/plant were -1.2429, -0.4006, -0.7564 and -34.329, respectively which indicate that germination, plants/pot, seeds/pod and seeds/plant decreased by 1.24 %, 0.40, 0.76 and 34.33, respectively for each % increase of initial seed borne infection of *C. corchori*. Sultana *et. al.* (2007) reported that the highest germination was found in 0.00% and the lowest germination was in case of using 20.00% initial fungal seed borne infection. They also reported that seeds having higher seed borne infections caused significantly higher amount of diseases development in the field. The loss in yield and quality of fibre and seed yield due to major diseases of jute has also been reported by others (Fazli and Ahmed 1960; Ahmed, 1966; 1968; Ahmed *et al*. 1980 and Biswas *et al*. 1985) which supports the present findings.

Percent germination of harvested seeds at greenhouse decreased with the increase of initial seed borne infection of *C. corchori.* The highest germination (98%) was recorded in seeds harvested from 0.00% initial seed borne infection of *C. corchori* and the lowest germination (70.00%) was recorded in seeds produced from 25.00% initial seed borne infection. Findings also marked that seed borne infection of *C. corchori* in harvested seeds increased with the increase of initial seed borne infection of *C. corchori.* (Table7). Under field condition, percent germination of

harvested seeds produced with different initial seed borne infection of *C. corchori* varied significantly. The highest germination (98.00%) was recorded at JAES followed by germination (96.00%) at Chandina Regional Station of BJRI for 0.0% initial seed borne infection of *C. corchori.* The lowest germination (65.33%) was recorded at Chandina Regional Station of BJRI, preceded by germination (70.53%) at JAES for 25.00% initial seed borne infection of *C. corchori* (Table 8). Haque. *et. al.* (1999) reported that negative relationship between % germination and % total pathogens were observed and the % germination decreased with the increase of initial seed borne fungal infections.

Percent seed borne infection in produced seeds under field condition with different initial seed borne infection of *C. corchori* varied significantly. The highest seed borne infection (30.00%) with *C. corchori* in harvested seeds was recorded at Chandina Regional Station of BJRI followed by seed borne infection (24.00%) at JAES for 25.00% initial seed borne infection of *C. corchori.* The lowest seed borne infection (3.33%) with *C. corchori* in harvested seeds was recorded at JAES. The highest total pathogen (36.17%) was recorded at Chandina Regional Station of BJRI followed by total pathogen (29.17%) at JAES for 25.00% initial seed borne infection of *C. corchori.* The lowest total pathogen (2.50%) was

recorded at JAES. (Table 10). Higher the initial seed-borne infection of the pathogens, higher the disease development in the field. (Fakir, *et al.* 1993). Islam *et al.* (2003) reported that initial seed borne infection of fungal pathogens viz. 0%, 5%, 10 %, 15%, and 20% infected seeds cause less seedling emergence in the field which is also in agreement with the present findings.

Relationships of % dead seeds, total dead seeds and % infected seedlings with initial seed borne infections of *C. corchori* viz. 0%, 5%, 10%, 15%, 20% and 25% at green house were positive and the regression coefficients were 0.5665, 0.7514 and 0.486, respectively for % dead seeds, total dead seeds and % infected seedlings. Findings evident that the rate of increase of % dead seeds increased by 0.55%, total dead seeds increased by 0.75 and % infected seedlings increased by 0.49% for each % increase of initial seed borne infection of *C. corchori.* Islam (2006) reported that the reduction of seed yield might be due to the major diseases of jute (anthracnose, black band, stem rot) causing death of seedlings, spread of diseases to standing crops, killing of even matured plants.

Seed yields under field condition produced with different initial seed borne infection of *C. corchori* were negatively related and varied

significantly. The highest seed yield (889.67kg/ha) was recorded at JAES followed by seed yield (876.33 kg/ha) at Chandina Regional Station of BJRI for 0.0% initial seed borne infection of *C. corchori.* The lowest seed yield (650.67 kg/ha) was recorded at Chandina Regional Station of BJRI, preceded by seed yield (700.00 kg/ha) at JAES for 25.00% initial seed borne infection of *C. corchori.* The higher the seed-borne infection of the pathogens, higher the disease development in the field. (Fakir, *et al.* 1993). Islam *et. al.*(2003) reported that as the initial seed borne infections increases, disease development in the field also increases and consequently cause the reduction in yield of seed and fibre which is in agreement with the present study.

Regression coefficients for % germination of harvested seeds produced with different initial seed borne infection of *C. corchori* were -0.9739 and -1.069, respectively for at JAES, Manikgonj and Chandina which indicates that rate of decrease of % germination of harvested seeds decreased by 0.97% and 1.069%, respectiely at JAES and Chandina for each % increase of initial seed borne infection of *C. corchori* (Figure. 10). The regression coefficients for seed yield of harvested seeds produced with different initial seed borne infection of *C. corchori* at JAES, Manikgonj and Chandina were -7.8343(kg/ha) and -9.2775

(kg/ha), respectively which indicates that rate of decrease of seed yield of harvested seeds decreased by 7.83 at JAES and 9.2775% at Chandina for each % increase of initial seed borne infection of *C. corchori* (Figure.11)**.** Fazli and Ahmad (1960) found that *Macrophomina phaseolina* and *Colletotrichum corchori* were responsible for the deterioration of quality and yield of jute seeds which support the present finding.

Transmission rate of *C. corchori* from seed to plant to seed is evident by regression line of Figure. 9 and indicate positive relationship between initial seed borne infection of *Colletotrichum corchori* with seed borne infection of *C. corchori* in harvested seeds at greenhouse. The regression coefficients for %infection of *C. corchori* in harvested seeds at greenhouse was 0.882%, indicates that the rate of transmission of % infection of *C. corchori* from seed to harvested seeds was 0.88% for each % increase of initial seed borne infection of *C. corchori*. Under field condition the transmission of rate of *C. corchori* from seed to harvested seeds were 1.32% and 1.05%, respectively for JAES and Chandina for each % increase of initial seed borne infection of *C. corchori*. Transmission of the major seed borne diseases including stem rot caused by *Macrophomina phaseolina*, black band caused by *Botryodiplodia. threobromae* and anthracnose caused by *Colletotrichum corchori*, from

seed to plant to seed revealed that germination of the seeds were found to decrease with the increase of initial seed borne fungal infection and resulted significantly higher amount of disease development in the field (Fakir, *et al.*1993).

CHAPTER 6

CONCLUSION

6. CONCLUSION

Altogether 600 seed samples of jute variety CVL-1of four seed tires namely breeder seed (15), foundation seed (5), certified seed (7) and farmers' seeds (573) were collected in October, 2010- March, 2011 and were subjected to germination and health test in the laboratory of Plant Pathology Department, BJRI. Seed samples from all seed tires were categorized on the basis of presence of *Colletotrichum corchori* as 0%, 5%, 10%, 15%, 20% and 25% infection and tested for seed to plant to seed transmission of *C. corchori.*

Germination of the collected seed samples varied significantly. The highest germination (96.00%) was recorded in breeder seeds and the lowest (67.33%) was in farmers' seeds. The total mean seed borne fungal infection varied from 3.55% to 37.99%. The highest seed borne infection (37.99%) with lowest germination (67.33%) was recorded in farmers' seed and the lowest seed borne infection (3.55%) with the highest germination (96.00%) recorded in breeder seed.

Seedling symptom test in water agar media conducted with seed samples of 0.00%, 5.00%, 10.00%, 15.00%, 20.00% and 25.00% initial seed borne

infection of *C. corchori* in the laboratory. The highest germination (96.00%) was recorded in case of 0.00% initial seed borne infection of *C. corchori* and the lowest germination (73.00%) was recorded in case of 25.00% initial seed borne infection of *C. corchori.* The highest post emergence infection (12.33%), germination failure (13.02%) and total death (25.35%) were recorded in case of 25.00% initial seed borne infection of *C. corchori* and no post emergence infection, germination failure and total death were recorded in case of 0.00% initial seed borne infection of *C. corchori*. Findings on the incidence of anthracnose at different time after sowing of seeds with different initial % infections of *C. corchori* at greenhouse reveals that all the samples had continuous increasing trend with the increase of time.

At greenhouse, seed yield parameters viz. plants/pot, pods/pot, pods/plant, seeds/pod and seeds/plant varied significantly and decreased with increase of initial seed borne infection of *C. corchori.* The highest no. of plants/pot (24.25), no. of pods/pot (704.50) and no. of pods/plant (29.70) were recorded and the lowest no. of plant/pot (14.33), no. of pods/pot (293.25) and no. of pods/plant (18.41), respectively were recorded for 0% and 25.00% initial seed borne infection of *C. corchori.* The highest no. of seeds/pod (45.58) and no. of seeds/plant (1323.22) and

the the lowest no. seeds/pod (25.81) and no. of seeds/plant (472.53), were recorded respectively for 0% and 25.00% initial seed borne infection of *C. corchori.* The regression coefficients for %germination, plants/pot, seeds/pod and seeds/plant were -1.2429, -0.4006, -0.7564 and -34.329, respectively which indicate that germination, plants/pot, seeds/pod and seeds/plant decreased by 1.24 %, 0.40, 0.76 and 34.33, respectively for each % increase of initial seed borne infection of *C. corchori.*

The highest germination (98%) in harvested seeds produced with 0.00% initial seed borne infection of *C. corchori* the lowest germination (70.00%) was recorded in seeds produced from 25.00% initial seed borne infection at greenhouse. Under field condition, the highest germination (98.00%) was recorded at JAES followed by germination (96.00%) at Chandina Regional Station of BJRI for 0.0% initial seed borne infection of *C. corchori and* the lowest germination (65.33%) was recorded at Chandina Regional Station of BJRI. The highest seed borne infection (30.00%) in harvested seeds was recorded at Chandina Regional Station of BJRI followed by seed borne infection (24.00%) at JAES for 25.00% initial seed borne infection of *C. corchori and* the lowest seed borne infection (3.33%) with *C. corchori* in harvested seeds was recorded at JAES.

There were positive relationships of % dead seeds, total dead seeds and % infected seedlings with initial seed borne infections of *C. corchori* viz. 0%, 5%, 10%, 15%, 20% and 25% at green house. Findings evident that the rate of increase of % dead seeds increased by 0.55%, total dead seeds increased by 0.75 and % infected seedlings increased by 0.49% for each % increase of initial seed borne infection of *C. corchori* of seedlings, spread of diseases to standing crops, killing of even matured plants.

The highest seed yield (889.67kg/ha) was recorded at JAES followed by seed yield (876.33 kg/ha) at Chandina Regional Station of BJRI and the lowest seed yield (650.67 kg/ha) was recorded at Chandina Regional Station of BJRI, preceded by seed yield (700.00 kg/ha) at JAES, respectively for 0.0% and 25.00% initial seed borne infection of *C. corchori.*

The regression coefficients for % germination of harvested seeds produced with different initial seed borne infection of *C. corchori* were -0.9739 and -1.069, respectively for at JAES, Manikgonj and Chandina. The regression coefficients for seed yield of harvested seeds produced with different initial seed borne infection of *C. corchori* at JAES, Manikgonj and Chandina were -7.8343(kg/ha) and -9.2775 (kg/ha),

respectively. Findings indicate that percent germination and seed yield decreased with increase of initial seed borne infection of *C. corchori.*

Transmission rate of *C. corchori* from seed to harvested seeds was measured by regression coefficients. The regression co-efficient for %infection of *C. corchori* in harvested seeds at greenhouse was 0.882 and under field conditions, were 1.05 and 1.32, respectively for JAES and Chandina regional station of BJRI. The transmission of rate of *C. corchori* from seed to harvested seeds were 0.88% at greenhouse and 1.05% and 1.2% for JAES and Chandian, respectively for the increase of each 1 % initial seed borne infection of *C. corchori*.

The following conclusion may be drawn for production of quality healthy jute seeds from the findings of this study:

1. Seeds having higher level of seed-borne infections with the pathogens may cause risk as regard to germination reduction. Low germination was recorded as regard to higher prevalence of initial seed borne infection of *C. corchori.*

2. There were negative relationships between seed yield parameters and initial seed borne infection of *C. corchori.* Negative relationships between % germination and % total pathogens were noticed.

Germination of the harvested seeds lowered with the increase of initial seed borne infections of *C. corchori.*

3. Seed borne infection with *C. corchori* in harvested seeds increased with the increase of initial seed borne infection of *C. corchori.*

4. Seed yield decreased with the increase of initial seed borne infection of *C. corchori*.

5. There were positive relationships between initial seed borne infection of *Colletotrichum corchori* and seed borne infection of *C. corchori* in harvested seeds at greenhouse and also under field condition pointed the transmission of *C. corchori* from seed to plant to seed.

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